The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

THE PIONEER IN ITS FIELD

A Monthly Review of Far Eastern Trade, Finance and Engineering, Dedicated to the Industrial Development and Advancement of Trade in Far Eastern Countries.

HEAD OFFICE: 16 JINKEE ROAD

George Bronson Rea, Editor and Publisher

SHANGHAI, CHINA.

William Carter Rea. Manager

JAPAN OFFICE: H. C. Huggins, Representative, No. 12 Takagi-cho, Akasaka-ku, Tokyo.

NEW YORK: British and Colonial Press, Inc., 738 The Knickerbocker Building, Broadway and 42nd Street. MANILA OFFICE: Fleming, Percy Smith and Seth,

Roxas Building, Escolta.

BERLIN: Rudolf Mosse,

46-49 Jerusalemer Strasse.

GREAT BRITAIN: Walter Judd, Ltd., 81-87 Gresham Street Bank, London, E.C.

SUBSCRIPTION IN CHINA: \$10.00 Mexican, U. S. & Philippines Gold \$5.00, Elsewhere \$12.00 Mexican per annum

VOL. XIX

APRIL, 1923

NO. 4

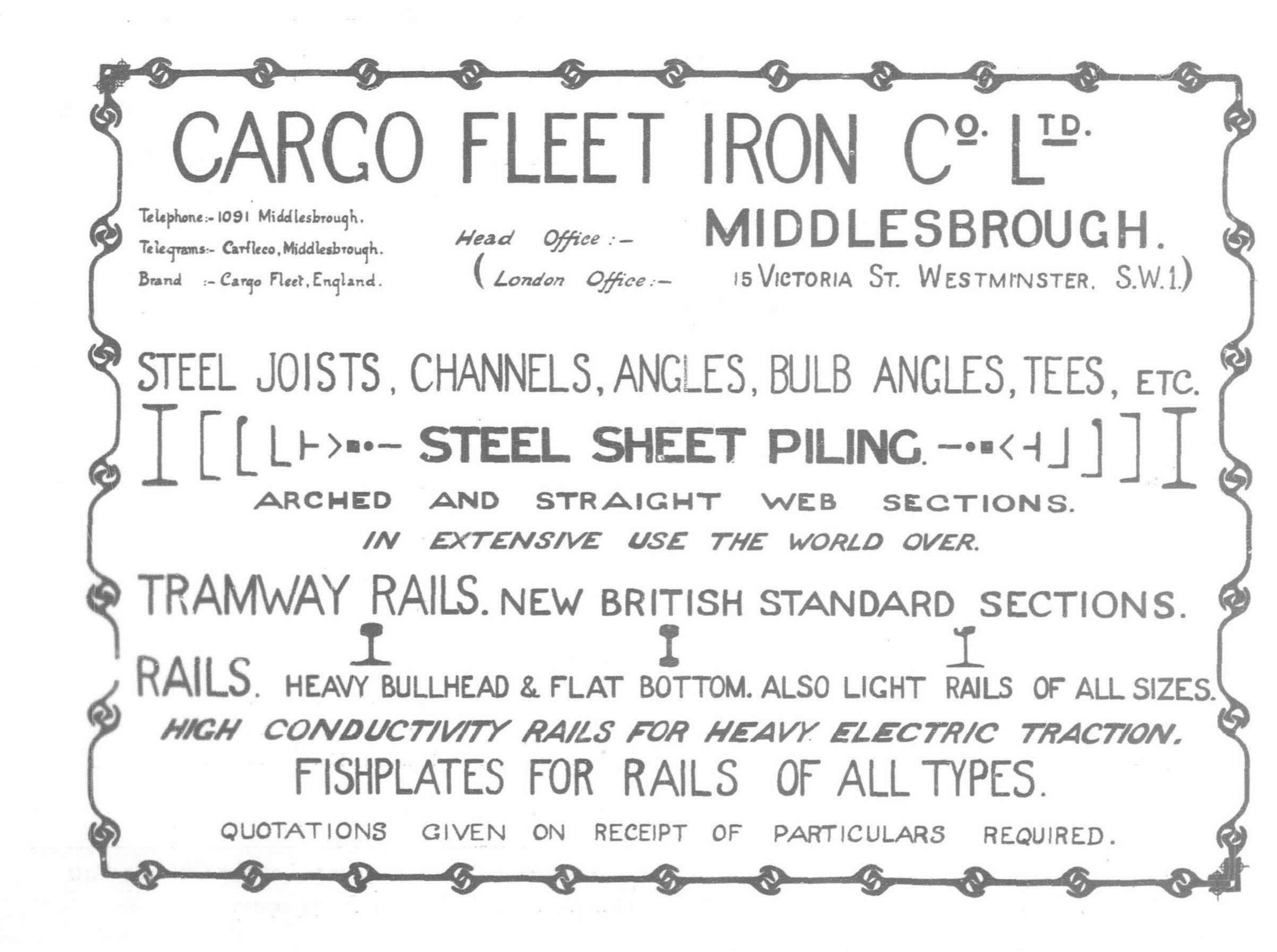
CONTENTS:

	The state of the s										
					Ĭ			PAGE]	Page
MAKING C	HINA SAFE FOR	AUTO	CRACY	***	***	***		221	YOKOHAMA SPECIE BANK NEW BUILDING	•••	*246
HONGKONG	G AND CANTON	* * *	***	* * *		•••	***	223	AUTOMATIC TELEPHONE SYSTEM AT DAIREN	***	*247
DOING THI	INGS IN JAPAN		* * *		•••		***	224	THE MANTETSU GENERAL HOSPITAL	***	*248
HARRIMAN	YS FAR EASTER	N PLAN	NS	0 0 0				*225	JAPAN'S PETROLEUM INDUSTRY	• • •	*250
THE KWA	NTUNG LEASE			***	***	***		229	WORLD'S BIGGEST TIN DREDGER	***	*251
PROPOSED	CHINESE COTTO	N MIL	L LOA	AN	***	***		231	A HYDRO-ELECTRIC PLANT IN HOKKAIDO	***	*252
Electrical Co	ourse in St. John's	Univers	ity					231	TIENTSIN-PUKOW TRAINS DE LUXE	•••	#253
RAILWAYS	S AND ROADS IN	NORT	н вог	RNEO	***		***	*232	FOR A GREATER TOKYO	***	*263
Powerful Gr	ab Hopper Dredger	for Bo	mbay		* * *	***		234	PULP AND PAPER MANUFACTURE	***	*267
36-TON BR	EAKDOWN CRAN	E FOR	THE	SN.R				*235	PUBLIC TRANSPORTATION	***	*272
A Belgian M	Aission to China	* * *		* * *	***		***	236	AMAZING GROWTH OF JAPANESE SHIPPING	***	*275
CEMENT II	NDUSTRY IN THE	E ORIE	ENT	***	***	***	***	*237	A French Resurrection	***	277
Electrical E	nterprise in Chir		* * *			***	- + +	239	Sinclair Sakhalien Interest Protected		277
THE FORE	IGN TRADE OF M	IANCH	URIA	* * *	* * *			*240	A SUPER-POWER ZONE IN JAPAN	***	*278

*Illustrated with Maps or Photographs

ALPHABETICAL LIST OF ADVERTISERS

Admiral Line, The	td



LIBRARY

FAREASTERN REVIEW

ENGINEERING FINANCE COMMERCE

SUPER-POWER ZONE FOR JAPAN

American Trains De Luxe for China

Greater Tokyo

New Cement Plants

Monster Tin Dredge for Malaya

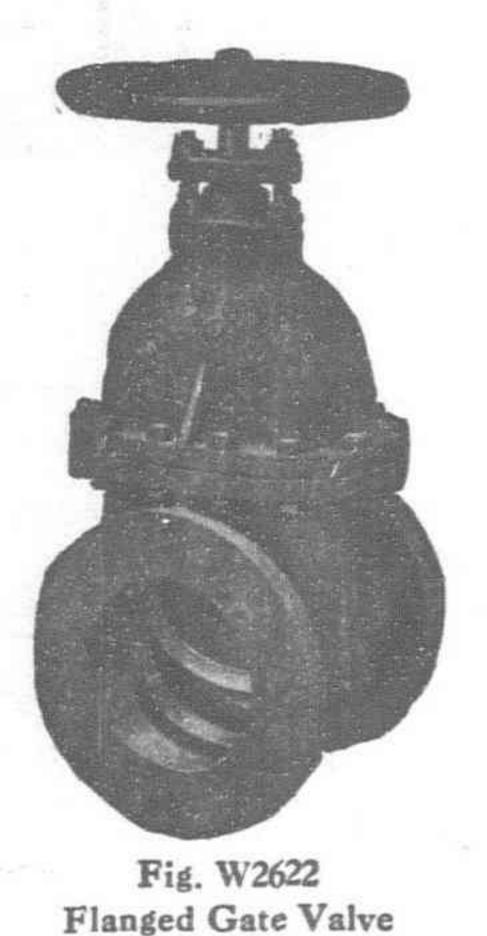
America in Manchuria

Making China Safe for Autocracy

25,16,25=25,167:55

Vol. XIX April, 1923 No. 4

SHANGHAI, PEKING, TORYO AND MANILA



IRON BODY VALVES

We manufacture a complete line of Iron Body and Steel Body Globe and Gate Valves, both screwed and flanged, for all pressures. All valves are carefully tested at our factory up to pressures far in excess of those for which they are recommended. All types can be repacked while under pressure with the valves wide open.

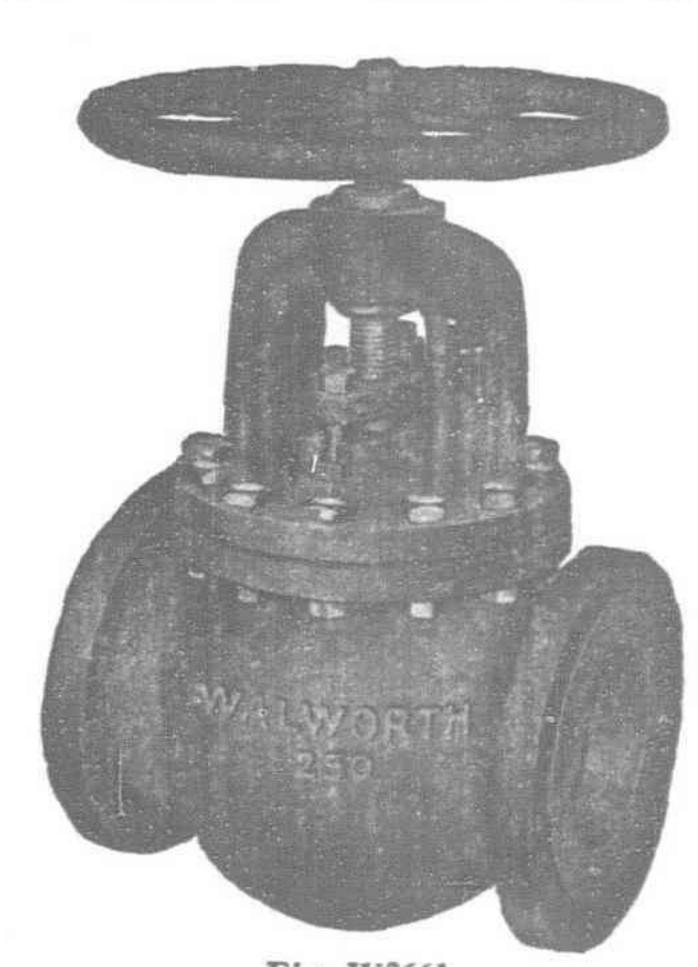


Fig. W3661 Flanged Globe Valve

For catalog, prices or information, address:

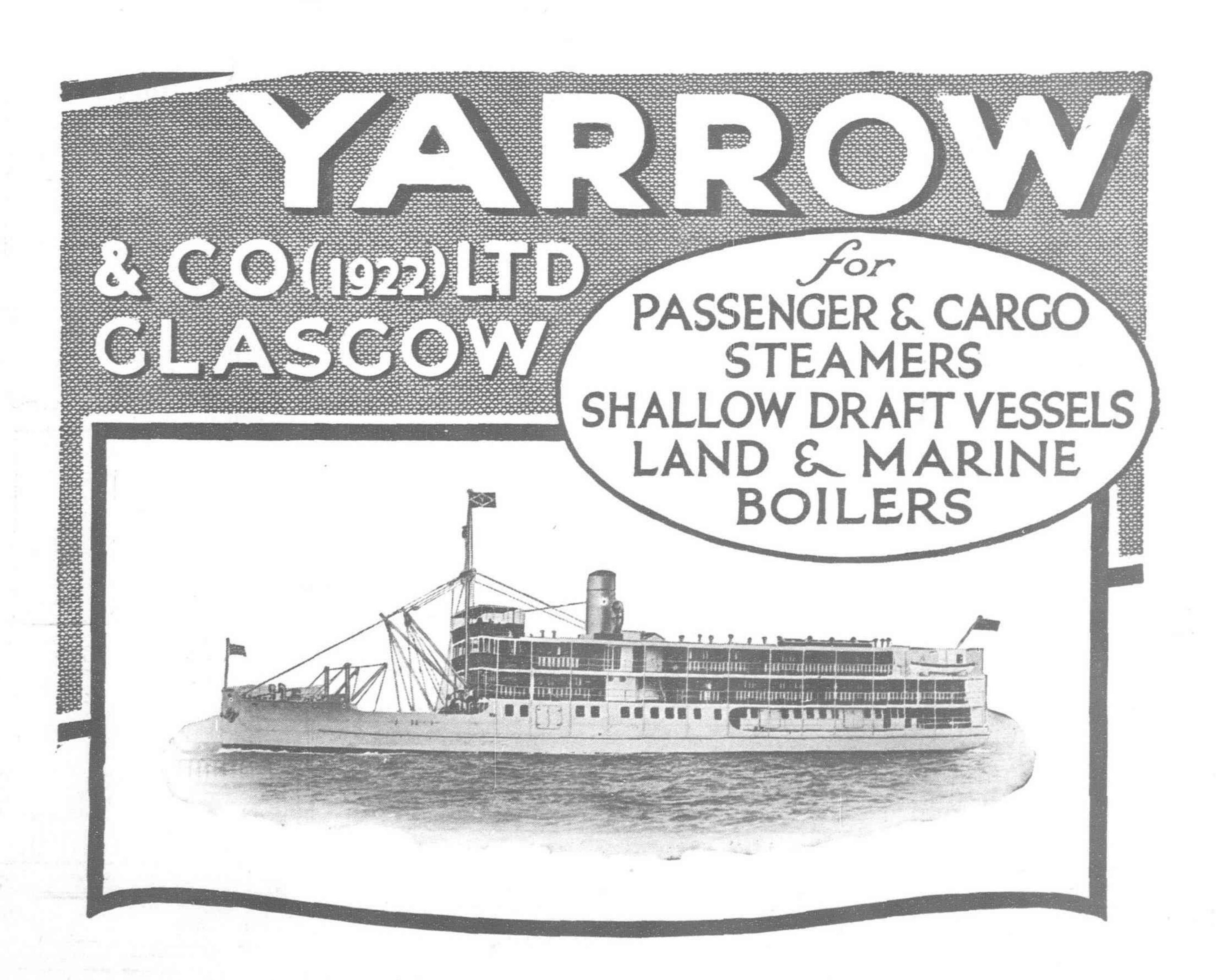
Kenneth Leavens, 22 Kiukiang

Walworth Manufacturing Co. Boston, U.S.A. Established 1842

Walworth International Co. New York Foreign Representative

Road Shanghai, China.

Manufacturers of 23,000 different items ~~~ Valves, Fittings, Tools for Steam, Water, Gas, Oil and Air



The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XIX

SHANGHAI, APRIL, 1923

No. 4

Making China Safe for Autocracy

The Indifference of the Liberal Powers

RE the foreign powers sincere in their proclaimed desire to assist China in stabilizing her government? If so, they must call a halt to the present policy of indifference to principles which is making China the stronghold of Asiatic militarism and betraying the ideals for whose preservation the soil of France was drenched with the blood of their subjects. The powers control the collection of China's most important revenues. By adhering to strict neutrality instead of a thinly veiled friendship for one faction, they can force a compromise that will bring unification in a few months. They should decline to support that military overlord, who, for the moment, dictates the appointment of the Peking cabinet, by retaining all surpluses from the salt and customs revenues until unification is attained. These revenues should be employed to meet legitimate foreign obligations and the surplus held in trust for a unified government. Once the tuchuns are deprived of this source of revenue and foreign recognition to their puppets in Peking withdrawn, the game will be played out and the way cleared for a compromise that will give the liberals an opportunity to govern which has hitherto been denied them by foreign financial assistance to the militarists from Yuan Shih-kai to Wu Pei-fu. The continued recognition to the appointees of the Kin-Han overlord is a disgrace to western diplomacy, a proclamation to the people of China that principles which apply in Europe and America cannot be extended to Asia; that democracy in China can expect no sympathy from those nations who terminated the rule of the autocrat in Europe.

Responsibility for further prolongation of the chaos in China is largely a matter which must be squarely faced by the United States and Great Britain. They must take the lead. France is not particularly interested in the problems of China at the moment. Japan is vitally interested. Her government and the best elements in the empire have come out firmly on the side of liberalism, but their hands are tied. For the present, Japan remains a silent spectator waiting for her partners to apply in China the same methods as were so successful in modifying her own policies. For it is well to keep in mind that Japan has followed the lead of her two great allies in all matters pertaining to China, she has reversed her pre-war program, set her house in order and swept her militarists into the discard in order to prove worthy of our respect and confidence: Japan is now waiting for America and Britain to practice

what they preach in China.

Let us not forget that it was public opinion at home and abroad which forced Japan into the ranks of democracy; that it was the propagandists of China who focussed the spot light upon her policies. The world was successfully humbugged and its attention diverted from the growth of the colossal military machine created for the suppression of democracy in China and the looting of a peaceful people. The time has arrived when the trick should be exposed; time that decent journalism in America and Great Britain should denounce the sham and bring the same pressure to bear upon the militarists of China as was brought to bear upon those of Japan. It is also time that the liberal governments of the west should atone

in part for the crime against Asiatic democracy by their many interventions in the past which consolidated the power of the militarists in China under the leadership of the Peiyang group of freebooters.

Owing to the control exercised by the authorities over the news services at Peking, the world remains in ignorance of the fact that time and again the establishment of a liberal government has been thwarted by foreign intervention in one way or the other, and in each and every case the crime against democracy has been supported and vindicated by a powerful claque with no regard for the principles underlying its own system of government or the aspirations of the great masses of China. At all times the militarists have been upheld by a group of journalists whose correspondence has been accepted at home as reflecting the true state of affairs. Rarely indeed, in the ten years of the republic has the liberal element in China been accorded a square deal from the dispensers of Peking news.

The reorganization loan of 1913 supplied the funds which consolidated the rule of Yuan Shih-kai as dictator, enabling him to dissolve the parliament, hound its members into exile, prison or death and advance his conspiracy to restore the monarchy. The liberal leaders protested vigorously against financial support to the man who even then was laying his plans to overthrow the republic and mount the dragon throne. These protests were ignored. The powers desired a "strong man" at the head of affairs. They had their way. They now realize how impossible it is to stop the growth of the republican idea. The leader denounced as a visionary in 1912 retains the confidence of the masses and is backed financially and morally by every Chinese residing overseas.

The coercion of China into severing relations with and declaring war against Germany once more gave the Peiyang gang a strangle hold on the country. They looked forward to a share of the American war loans to consolidate their power and when these were withheld, turned elsewhere for assistance. With Japanese money, advanced in most cases, to enable Peking to discharge its war obligations, the Peiyang group waged a campaign to destroy in China the principles their allies were struggling to uphold in Europe. While the allies were making the world safe for democracy in Flanders and in France, the Peking militarists were ruthlessly suppressing democracy in China. Their participation in the war was the greatest mockery in history, a base betrayal of those who were sacrificing their lives for the perpetuation of democratic ideals. The liberal leaders protested against a step which they clearly forsaw would set back the movement for representative government. In so doing they exposed themselves to the charge of being pro-German and brought down on their heads the full force of a ruthless propaganda which ruined the prestige of any and all who failed to accept the allied view. Their protests were again ignored and democracy in China sacrificed in order that democracy in Europe might survive. The liberation of Europe from the yoke of a predatory military autocracy was celebrated by riveting the chains of a feudal despotism upon the patient masses of China.

Through it all, there was not a foreign voice raised in protest. The Peking claque applauded and redoubled its efforts to discredit the liberal leader. The president-makers controlled the sources of news and moulded world opinion to their view-point. They then hand-picked a tuchun of the Yangtze who was to have been propaganded into power at Peking. When he died, they turned to Wu Pei-fu as the next "strong-man," groomed him, boosted him, placed a halo around his head and invited the world to behold the "savior of China." The legations accepted the choice and supported the new aspirant to the mantle of Yuan Shihkai. And when one of Chang Tso-lin's generals threw the victory in last year's war to Wu, the Peking boosters decided that the time had arrived to throw discretion to the winds, repeat the mistake of 1913 and knife democracy by providing the funds to solidify his control. Liberalism in China was to have been once more betrayed through financial assistance to a military overlord whose one solution to his country's sorrows was unification at the point of the bayonet. Once more, it was the citizens of the liberal nations of the west who urged the immediate advance of funds to elevate a military dictator to supreme power, and strange to relate, it was Japan's refusal to participate in such a loan through the consortium which defeated this third attempt to clamp the yoke of militarism on the necks of the Chinese people. Japan took the firm stand that such a loan to any one faction pending complete unification would constitute a direct and unwarranted intervention in the affairs of China. The liberal government of Japan appeared at this juncture as the one friend of liberal government in China.

Thwarted in their efforts to obtain a foreign loan to bolster up their idol, the hirelings of the feudal system have since placed every obstacle in the way of unification, knowing full well that with the triumph of liberalism their days of usefullness in Peking will be terminated. The liberal leader of China has been reviled, ridiculed, accused of being a bolschevist, a labor agitator and a menace to society. But in spite of the most contemptible campaign ever waged to besmirch the reputation of a political leader, the population of Canton turned out enmasse to welcome the return of Sun Yat-sen to power. He emerges from the treason of last year stronger than ever, a proof, if such proof be needed, that the principles he stands for are a vital force in Chinese politics. If he should die to-morrow, the cause of good government will survive. Others will carry on until democracy triumphs over the petty military despots now recognized by the powers as the government of China.

After the unsuccessful attempt to finance Wu Pei-fu, a mistake that resulted in at least one diplomatic transfer, the powers are now waiting, so they declare, for the Chinese to solve their problems in their own way, refusing to take action which may be construed as support to any one faction. On its face, this is sound diplomacy: analyzed, it reveals a determination to support the old order of things and perpetuate the power of the militarists. While professing neutrality, the powers insist upon recognizing the faction, who, for the moment, may dictate the appointment of a cabinet in Peking and of paying into this illegal government the surplus customs and salt revenues collected under their supervision. In this one action, they give the lie to their protestations of disinterestedness, and announce their preference for the "Hope of China" by furnishing him with the surplus salt and customs revenues to assist in carrying out his campaign of pacification at the point of the bayonet,

Eight cabinets have come and gone the past year in Peking and with each kaleidoscopic change the legations have hastened to recognize the new incumbents and to hand over the revenues which enables Wu Pei-fu to impose his will north of the Yangtze. This may be non-intervention in the affairs in China, but it certainly is not considered in this light by Sun Yat-sen or the southern leaders, who characterize it as an open and unwarranted interference in the settlement of China's difficulties, a flagrant violation of international morality, made doubly obnoxious to the liberal leaders by

the fact that this continued recognition and payment of surplus into the treasury of the Kin-Han warlord is now the one obstacle to unification.

It is well to face the facts of a situation which has simmered down to a struggle between Wu Pei-fu and Sun Yat-sen, to one between militarism and democracy, in which the forces of reaction are supported and recognized by the powers and excused by the powerful claque controlling the dissemmination of news from Peking. Chang Tso-lin, the "uncrowned king" of Manchuria, Tuan Chi-jui, the Anfu chieftain and Sun Yat-sen, the liberal leader of Canton, have reached an understanding. Negotiations are now being carried on with Tsao Kun, head of the Chihli party, who seems willing enough to join the others, but to do so must subordinate Wu Pei-fu to his authority. The liberals demand the extinction of the satrap who has boasted that he will not rest until his armies have compelled unification by force. To this grievance is added the protest of the labor guilds against the order of the Kin-Han general which resulted in the execution of over a hundred strikers on the Peking-Hankow Railway. The Kuomintang party recently admitted the labor guilds in Canton into its ranks and both are determined that there can be no settlement of China's difficulties unless the power of Wu Pei-fu be broken. As against this decided stand, Wu and his cohorts, supported by the recognition of the powers as the legal government and lauded by powerful press agents, insist that no compromise will be entertained short of unification by the sword. The issue is therefore clearly one between Wu and Sun, between reaction and liberalism, between autocracy and democracy, between the idol of the masses and the despot who ordered the execution of the Kin-Han workers.

The powers are not sincere in their present policy. They remained neutral during the first revolution, when for over a year there was no recognized authority at Peking. Now, instead of standing aside in a spirit of strict neutrality they recognize and pay the customs and salt surplus into the shifting cabinets of Peking nominated by Wu Pei-fu. In effect, they remain in official contact with whoever holds the archives, recognizing as the government of China, the keeper of the pigeon holes of the Waichiaopu. For over a year they have been flouted by officials who have no authority even in their own departments and none whatever outside the walls of Peking and whose sole excuse for being there at all, is to keep alive a fiction that will ensure to their master the customs and salt revenues as it is doled out by the foreign repositories at the command of the legations. The time has arrived to stop a farcical neutrality which deceives nobody. It is time to force a peaceful settlement of the internal issues of China which will bring to the people the bless. ing of a truly representative government without another armed campaign for unification such as Wu Pei-fu is preparing for the coming summer.

Ordinarily, the withholding of the customs and salt surpluses would provide ample justification for the Peking government to default payment on all loans unsecured by these revenues. But this is the exact situation in China to-day: all loans and obligations not secured on these two revenues have been repudiated or defaulted and the one hope of further financial assistance to the militarists seems to consist in the prospective increase in the customs revenues agreed to by the powers. We hear nothing about employing this increase to pay off outstanding foreign loans: all talk to date centres on how to utilize it to raise new loans to maintain Wu Pei-fu and his faction in power. And just so sure as this customs increase is paid over to the puppets of Wu, it will be employed to push forward his summer campaign to annihilate the southern forces. Once more, the cause of good government in China will face the bayonets of reaction, and if the latter succeed in again ousting Dr. Sun Yat-sen from Canton, the responsibility will go straight up to the legations of the great powers who by their violation of neutrality will have financed the campaign to make China safe for autocracy.

Hongkong and Canton

The New Trend of British Policy in China

arrived at between the authorities of Hongkong and Dr. Sun Yat-sen on the occasion of the latest and latest to that port while enroute to resume control of the Canton government. This understanding, we now learn, has a much wider significance than appears on the surface, amounting in fact to a tardy recognition on the part of Hongkong of its dependence upon the development of the southern provinces for the advancement of its own special interests, in which co-operation and harmonious relations with Canton is essential to success. The future of Hongkong will hinge largely upon its ability to establish and operate profitably various industrial enterprises drawing their raw materials from the mainland. In effect, the understanding is simply the recognition of a new sphere of British interest based on the geographical position of the colony and dependence upon its own immediate hinterland for the supply of raw materials. It marks the end of the traditional British policy in the Yangtze region, made necessary by the Washington treaties which throws this section open to international competition.

Under the new order of things, the future commercial sphere which the British may legitimately aspire to dominate by reason of their natural advantages, is that section of China tributary to the port of Hongkong and the Kowloon Leased Territory. Here they may hope to successfully compete with all others and establish co-operative industries with the southern Chinese, the profits from which will more than repay them for the surrender of any exclusive privileges hitherto enjoyed in northern or central China.

Recognition of these conditions naturally carried with it the necessity for a radical modification of past policies, in which the future of the colony takes precedence over British interests in other parts of China. It brought home to the Hongkong authorities the realization that British policy as advocated by its Peking exponents was highly inimical to the best interests of the colony; that Hongkong could not hope to grow and prosper if the antagonism to Canton was permitted to remain the cardinal feature of a propaganda directed by British writers in the pay of the Peking government.

The shrewd merchants of Hongkong awoke to the fact that this vicious campaign had engendered an intense ill-feeling in the south which brought about the reprisals of last year. In the shipping strike Hongkong paid the penalty in millions of dollars for the long-drawn-out campaign directed from Peking to discredit Sun Yat-sen and the Canton cause.

Furthermore, it may be said without violation of confidence, that the understanding between Hongkong and Canton was hastened by the frank recognition of Mr. A. G. Stephen (head manager of the Hongkong and Shanghai Banking Corporation) that time had proved the justice of Dr. Sun Yat-sen's opposition to the reorganization loan of 1913. Dr. Sun vigorously protested to Mr. Stephen against the issuance of the loan, giving as his reason that the funds would be employed to destroy the republic and instead of unifying and stabilizing the government would split the country wide open. After ten years, the British banker admits that Dr. Sun was right, and so paved the way for a further exchange of views.

The experience of the past ten years has taught Hongkong that its interests have not been advanced by adhering blindly to a conception of British policy dictated by interested parties in Peking; that Canton cannot be easily eliminated as a factor in the Chinese political situation by denunciations of its program or villification of its popular leader. In fact, experience has disclosed that British interests whether in Hongkong or in other parts of China, are exceptionally vulnerable and at the mercy of organized labor now openly allied with the party of Sun Yat-sen. That reprisals against British interests have occurred is traceable directly to the campaign

waged by British newspapers to discredit Sun Yat-sen and elevate the Kin-Han war lord to supreme power. When it is furthermore understood that Wu Pei-fu was specially selected by the Peking journalistic group of president-makers as the man best qualified to rule China and it was their propaganda which contributed so largely to Dr. Sun Yat-sen's overthrow, further light is thrown on the reasons underlying the reprisals against British interests by means of strikes. In other words, if British interests have suffered as a result of these labor disturbances, they can thank those British propagandists operating from Peking who have left no stone uncovered to discredit the cause and personal character of Sun Yat-sen. Human nature being very much the same the world over, the adherants of Dr. Sun employed the only weapons at hand to emphasize their disapproval of a campaign which bore all the ear-marks of official British approval.

With these facts before them, it was not such a difficult matter for Dr. Sun and the Hongkong authorities to arrive at a mutual understanding of each other's position and pave the way for the establishment of relations which are bound to have a far-reaching effect on the future of the colony and the success of good government in China. It was realized by Hongkong that much of its present prosperity is derived from the investments of southern Chinese and their overseas relations who prefer the stable government of the colony with its guarantee of property rights to the chaotic conditions existing in the adjacent province. As a result of these conditions, Hongkong is overflowing with Chinese money, bringing down the interest rate of the banks and making it increasingly difficult to find profitable investments within the colony. Property values have soared to unheard of prices and considerable new Chinese capital seeking a fair profit, has been invested in local companies. This influx of wealth has increased prices all along the line, causing embarassment to European residents and merchants, a situation which shows no sign of amelioration until Kwantung is once more freed from political chaos and stabilized under an efficient government.

Here we have another potent reason why Hongkong is anxious to facilitate the establishment of popular government in Canton, it being realized that such government must meet with the approval of the masses and not forced upon them by the bayonets of the north. Peking may compel allegiance to its authority by military occupation, but it would require constant vigilance and the expenditure of huge sums for military purposes to impose these conditions indefinitely. Aside altogether from the drain on the central treasury to subjugate and occupy Canton by northern troops, the situation would remain menacing alike to Chinese and Hongkong interests. Chinese capital in the colony and from overseas would still refuse to embark in any enterprise under their own government and continue to swell the bank balances and unsettle the local financial market, while the establishment of any new industrial enterprise in the colony relying upon Chinese territory for its raw materials, would be out of the question.

One of the principal grievances of Chinese residing in and subject to British laws in Hongkong was the restrictions imposed upon them (due to the consortium pact and British policy as laid down by London and Peking) to their extending open financial assistance to Dr. Sun Yat-sen in his campaign for the implanting of a liberal government. This restriction was also felt by Chinese residing in the Straits Settlements and the Federated Malay States. Such financial assistance as they have been able to extend to Dr. Sun in the past has been frowned upon by the British authorities. Probably the most important feature of the understanding arrived at, is the reversal of the above policy, in which Chinese under British jurisdiction will be free to render financial assistance through the medium of open loans to the Canton government without incurring official disapproval. As a result, Chinese capitalists of Hongkong

are now prepared to furnish Dr. Sun with a loan of six millions to which will be added other loans from their compatriots in Malaya.

This policy has the double advantage of relieving Hongkong of a glut of capital and of recognizing the undoubted right of the Chinese to support the Cantonese leader. Although there is reason to believe that the support tendered to Dr. Sun by Hongkong went even further, this much is acknowledged.

It cannot be said that the hostility of the anti-Sun foreign element in Hongkong is entirely eradicated, but even his worst enemies are remaining neutral and willing to give him a fair chance to work out his plans for unification from Canton without harassing him by further abuse. His critics concede that with five years of uninterrupted tranquility, in Canton, the old city of the dreadful stink will be rebuilt into the most modern metropolis of China. This will call for the establishment of industries, machine shops and other enterprises, the equipment for which, the British merchants of Hongkong will be in the most favorable position to furnish. Hongkong capitalists have planned the erection of steel and iron works in Kowloon where ample iron deposits exist, but they look to Kwangtung for coal and limestone. The cement works are now importing limestone from Haiphong because of the difficulties surrounding its quarrying and shipment by junk from the North River districts to Kowloon. Coal is found in many parts of Kwangtung and could be mined, transported and sold in Hongkong at prices much lower than those now prevailing. Other products of the mainland are indispensable for the future industrial life of the colony, and it is now realized that a spirit of co-operation must supplant the old worn out policy of antagonizing the Cantonese by constantly belittling and besmirching the character of their chosen leader. Hongkong and Canton must pull together.

The understanding between Hongkong and Dr. Sun marks the beginning of a new era for British interests in China, a termination of the petty, undignified and spiteful campaign waged by a few journalists in Peking who have attempted to dictate British policy from the viewpoint of their own selfish interests. From now on, it is to be hoped that Hongkong and Canton will march in complete accord and in full co-operation for the development of that part of China where the interests of both are so intertwined that any other course would be suicidal. So we come to the end of another chapter, placing a period to the ten-year campaign to discredit Sun Yat-sen. If Sun can hold Canton, the cause of good government will triumph in China: if he wins, the support of Hongkong will stand as the turning point in the long-drawn-out struggle. It only remains for the American government to come out on the side of fairplay and its own traditions to bring China into the ranks of the liberal nations. The liberal government of Japan has lined itself against militarism in China, it stands, morally at least, with Dr Sun Yatsen. What Hongkong says, especially when dictated by the chief of the Hongkong and Shanghai Banking Corporation, sooner or later becomes the corner stone of British policy in China. Hongkong has spoken. The colony stands with Canton, and its popular leader. It now remains for America to speak in tones that will convey to the freebooters of the north that their days are numbered. There is only way that China can be made safe for democracy; we pointed it out in the preceding article.

G. B. R.

Doing Things in Japan

A Great Opening for American Capital to Co-operate in the Development of an Industrial Nation

TAPAN is doing things, big things. While the rest of Asia is seething with political discontent and the wheels of progress checked, Japan is solving the problem of her scanty fuel supply, her labor troubles, high costs of living and industrial future. Slowly but surely, she is getting back to normal financial conditions and preparing to regain the position she has temporarily lost in the markets of Asia. Japan has made up its mind that it must exist as an industrial nation and employ all the advantages that geography

and nature has given to it in order to hold its own in the keen competitive struggle for existence that faces it in the future. Japan is weak in many natural resources, prin. cipally coal, which has risen very high in price since the war. However, she is liberally supplied with water power, officially estimated at 10,000,000 kilowatts, of which, 7,000,000 is located on the main island. This source of natural wealth is being developed as rapidly as possible with domestic capital, but the task is so great that unless foreign capital co-operates in this profit. able enterprise, many otherwise excellent schemes will have to be indefinitely postponed.

The centre of immediate developments lies in the larger in. dustrial cities of the main island, at Tokyo, Yokohama, Nagoya, Osaka, Kobe and Kyoto, and to meet the demands of the manu. facturing establishments in these districts many large and small power plants have been erected and several power combines created. Amongst these are the Tokyo Electric Light Company, the Inawashiro, the Kinugawa, the Ujigawa, the Nippon, the Daido and other companies, while in the western district are found the Sanyo, the Bisaku, the Hiroshima, the Shikoku and the Kyushu companies. In the case of the Daido company the building program for the next ten years contemplates a total output of 640,000 kilowatts. Similar programs have been drawn up for the expansion of other large combines, so it may be said that to-day Japan presents the most interesting market for electrical material in the world, in which the manufacturers of all nations are keenly competing for the business alongside the Japanese concerns whose names are already a household word in the electrical industry.

Japan is leading in the electrical development of Asia in a large way and other nations more advanced in so-called western civilization may learn much to their profit by the problems that are here being tackled in characteristic Japanese fashion and worked out on a practical basis. Not alone in industry is the field for electrical power in Japan most promising and profitable, but the future holds bright for the electrification of not only the state railways but the entire transportation system of the empire. The government has already made the first steps in the replacement of steam locomotives by electrical, the first order for thirty-five having been placed in England several months ago, and some have since ordered from American manufacturers. The task of electrifying the 1,414 miles of main line state lines on the main island, is tremendous, calling for a total estimated power of 226,000 kilowatts to be completed within the next ten years. In addition to this, there are 131 private steam railways with a total of 1,892 miles capitalized at Y.235,000,000, which will call for another 250,000 kilowatts in power and enormous amounts of equipment.

Owing largely to the senseless propaganda calculated to destroy confidence in the business integrity of Japan and the silent, passive opposition to any proposition that savored of American and Japanese business co-operation that might be extended to China, Japanese bonds have had a hard time securing a foothold on the American financial market. These conditions are, however, changing. The corner has been turned and several minor loans and cooperative enterprises have resulted from the clearing of the political atmosphere in the Pacific, and there are bright hopes that American capital will now see its way more clearly to participate with Japan in the development of its many resources.

In discussing this matter with a well-known Japanese financier recently, he invited attention to the fact that the electrical field in Japan was of more value to Americans than the prospective railway business of China for the next quarter century, adding, in parenthesis, that the capital of the Daido Electric Power Company and its associated enterprises alone was greater than the total capitalization of the Chinese government railways. The electrical market in Japan for the next two decades offers not only a most attractive field for the investment of American capital, but carries with it a market whose importance to our manufacturers is far more certain and profitable than any other on the continent of Asia.

Harriman's Far Eastern Plans

The Inside History of the American Attempt to Gain Control of the South Manchuria Railway as a Link in the Harriman Round-the-World Transportation System

(Extracted from "E. H. Harriman," a Biography by George Kennan, Published by Houghton Mifflin Company, Boston and New York)

RITTEN in memory of the great American "whose services to the science of railroading will hardly be reckoned by those who know what his work was, as less than those rendered by George Stephenson himself," the biography of E. H. Harriman by George Kennan throws a light on the inside history of American railway finance that goes far to wipe out the misconceptions which surrounded some of his operations. Harriman is shown in his proper light,

one who had no time for quarrelling with others or rushing into print to defend his actions when subjected to criticism. "The people always find out what's what, in the end, and I can wait. I need all my time and energy to do things" was his characteristic answer to a friend who said he would be misjudged if he failed to defend himself. Harriman started things when he moved and in most cases carried out what he started. The most important chapter of the biography to Far Eastern readers is the one devoted to his plans to acquire control of the South Manchuria Railway. Here he certainly started something, and laid the basis of an American policy that considerably complicated the international political situation in this part of the world, Harriman's plans were undoubtedly sound from the financial and railway point of view, but he apparently gave no thought to the tremendous racial and political problems involved in American control of transportation lines traversing a disputed territory where all indications pointed to the outbreak of another great war. The chapter giving the inside history of his plans follows:

Mr. Harriman's direct business relations with the Far East began in the year 1905. The aid given by

Kuhu, Loeb & Co. to the Japanese government in floating its war bonds, as well as Mr. Harriman's own interest in China and Japan, based on his connection with the Pacific Mail Steamship Company, early attracted his attention to that part of the world, and when in the spring of 1905, he received an urgent invitation to visit Japan, from the American minister in Tokyo, Mr. Lloyd C. Griscom, he determined to suspend for a time his financial and railroad activities in the United States and look over personally the Oriental field, with a view to ascertaining what could be done for the extension of American commerce in Far Eastern countries.

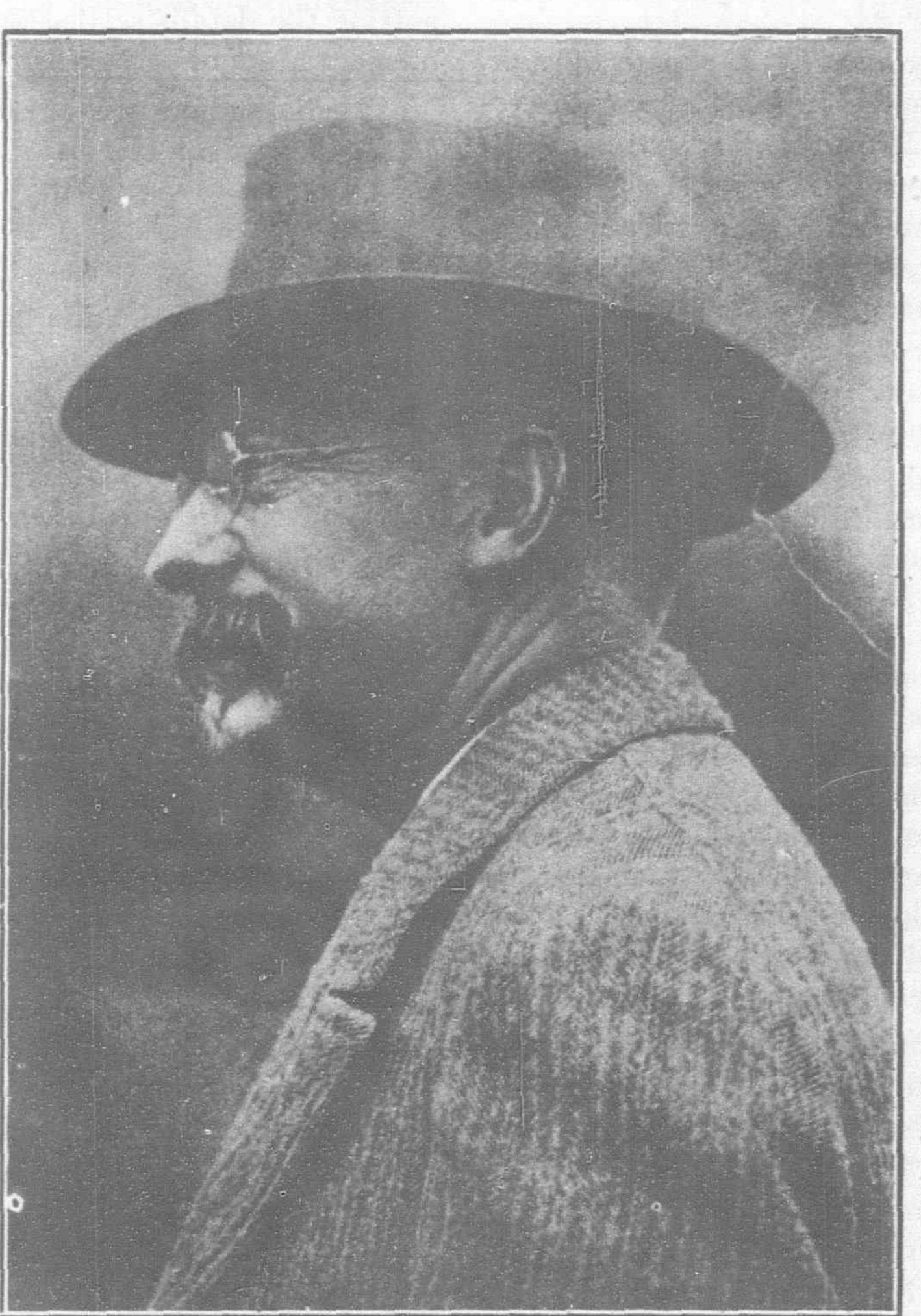
"It is important," he said in a letter to Mr. Griscom, "to save the commercial interests of the United States from being entirely wiped from the Pacific Ocean in the future," and "the way to find out what is best to be done is to start something." This

proposal to "start something" was characteristic of Mr. Harriman's methods. He did not think it necessary to perfect all the details of a plan before going to work. When he had clearly defined the object to be attained, his policy was to "start something," and then work out the scheme in accordance with circumstances and conditions as they might arise. The clearly defined object that he had in view in this case was the extension of American influence and the promotion of American commerce in the Far East; but

beyond this, with the details not yet worked out, was a plan for a roundthe-world transportation line, under unified American control, by way of Japan, Manchuria, Siberia, European Russia, and the Atlantic Ocean. Such a railroad and steamship line; if successfully established, would unite for commercial purposes four of the most populous countries on the globe; and would enable the United States not only to take a commanding position in the Orient, but to supply the wants and direct in some measure the commercial activities of hundreds of millions of people in the least developed parts of Europe and Asia.

To most observers at that time a round-the-world transportation line under American management, would have seemed an unreliable dream, but Mr. Harriman had made many of his visions come true, and he believed that he could give objective reality to this one. His plan was, first, to secure control of the South Manchuria Railway, which Japan, through the fortunes of war, had just acquired from Russia. This road was then in a very unsatisfactory physical condition; but Mr. Harriman proposed to re-construct and re-equip it with American capital, and make it the eastern part of his proposed trans-Asiatic line. Having secured

this essential link, he intended to buy the Chinese Eastern, which he thought the Russians, having lost Port Arthur, would gladly sell, and then acquire transportation or trackage rights over the transsiberian and the Russian government roads from North Manchuria to the coast of the Baltic Sea. These acquisitions, in connection with the Pacific Mail Steamship Company and the American railroad systems that he already controlled, wholly or in part, would give him a continuous line more than three-quarters of the way around the globe, and it would be a comparatively easy matter, thereafter, to connect up the termini by establishing a line of steamers across the Atlantic from the United States to Russia. He anticipated most difficulty in persuading the Japanese to surrender or share the control of the South Manchuria road, which, with the Fushun coal-fields adjacent thereto and the southern part of the island of Saghalin, were all that they had been able to get from



The Late E. H. Harriman

Russia, by way of indemnity to cover their colossal war expenditures. However, he had strong hope of success, for the reason that the Japanese were heavily in debt and urgently in need of capital for the improvement of their transportation facilities and the development of their recently acquired territory on the Asiatic mainland. The purchase of the Chinese Eastern and the acquirement of the necessary rights over the trans-Siberian he regarded as comparatively easy. Russia had allowed a Baltimore capitalist to build and manage her first railroad, from St. Petersburg to Moscow, and had even asked an American engineer to finance and construct the great road from the Urals to the Pacific. It seemed probable, therefore, that the Czar would gladly make concessions to American capitalists if, with their aid, he could have the trans-Siberian line double-tracked, properly equipped, and efficiently managed.*

Preparations for the trip to the Orient were begun. The party sailed from San Francisco on the steamship Siberia August 16 and, after short stops at Honolulu and Midway Island, arrived in Yokohama on the evening of August 31.

The reception given to Mr. Harriman by Japanese officials, financiers, and business men was extremely cordial. Representatives of the Bank of Japan and the famous Mitsui Company boarded the steamer as soon as the anchor was down, and when the party had landed and taken quarters at the Grand Hotel, calls and assurances of welcome were received from the president and vice-president of the Industrial Bank of Japan; the manager of the Japan Steamship Company; Count K. Inouye, one of the "Elder Statesmen;" Baron Iwasaki, Senator Watenabe, and Mr. K. Mori, a personal representative of the minister of finance.

As Mr. Harriman could spend only a limited time in the Far East, and as he desired, before his return, to visit China and Korea, he was obliged to promote his round-the-world-line enterprise, as far as it could be promoted in Tokyo, by a "whirlwind campaign" of visits and interviews. Between September 1 and 13, he made the acquaintance of all the prominent statesmen in Japan, including Marquis Ito, Count Okuma, the premier, and most of the ministers; and succeeded in awakening the interest and enlisting the support of several eminent financiers, including especially Mr. J. Soyeda, president of the Japanese Industrial Bank. Having accomplished this in a few days, he and his party started on September 13 for Kyoto and Kobe, leaving further negotiations for the acquirement of the South Manchuria Railway in the capable hands of Minister Griscom and President Soyeda.

During Mr. Harriman's absence, Minister Griscom did all that could be done to promote what seemed to him the best interests of the United States in the Orient by persuading the higher Japanese authorities to consider favorably Mr. Harriman's plans. In his interviews with Premier Katsura, Count Inouye, and the minister of finance, he took the ground that co-operation with America would be in every way profitable to Japan, by strengthening her credit, furnishing her with capital for the improvement of her transportation system, facilitating her trade, and enabling her to develop quickly and fully the material resources of her recently acquired territory on the Asiatic mainland. The South Manchuria Railway was urgently in need of reconstruction and re-equipment, and there was no man in America, perhaps in the world, better qualified by experience and ability to direct such work than the rebuilder of the Union Pacific. Mr. Harriman's relations, moreover, with American bankers and financiers were such that he could secure at once the pecuniary support which Japan needed, but which she alone might not be able to get quickly enough to meet the emergencies of the situation. The suggested project would bring Japan and the United States into much closer relations, both commercially and politically, and if successful it would furnish a large revenue to the Japanese government and thus compensate the Japanese people for their failure to get a pecuniary indemnity from Russia.

In his negotiations with the higher authorities, Mr. Griscom was ably assisted by Mr. Durham W. Stevens,† who had been in the service of the Japanese government for more than twenty years, and who had earned the respect and trust of all the emperor's statesmen and officials.

The result of their joint efforts was in every way encouraging. Premier Katsura said that he would give the matter immediate and serious consideration, and Count Inouye, one of the most influential of the elder statesmen, promised that he would call a meeting of the minister of finance, the minister of communications, and other high officials directly interested, and would try to reach a decision at once. Count Inouye himself was very favorably impressed and said to Mr. Griscom: "We would be very foolish to let such a great chance slip."

When Mr. Harriman returned to Tokyo, on October 8, negotiations were so far advanced that the imperial authorities were ready to consider promptly, if not to accept, a definite proposition; and in three or four days of strenuous activity he succeeded in getting the details settled and reduced to writing in the following memorandum of agreement:—

Memorandum of a preliminary understanding, dated October 12, 1905, between His Excellency Count Katsura Taro, representing the Japanese government, and Mr. E. H. Harriman, representing himself and associates.

"A syndicate to be formed to provide capital for the purchase of the South Manchuria Railway, acquired by the Japanese government, and its appurtenances; the rehabilitation, equipment, reconstruction and extension of the same, and the completion and improvement of the terminals at Tairen (Dalny); and it is understood that the two parties are to have joint and equal ownership in the properties acquired. Permission to work coal mines (in connection with the railroad) to be given to a corporation by special agreement, in which there shall be joint interest and representation.

The principle of development of all industrial enterprises in Manchuria shall be such that each party shall have the right to an equal interest with the other. The Manchurian railroad, with its appurtenances rails, cross-ties, bridges, superstructure of all character, stations, buildings, platforms, warehouses, docks, wharves, etc., to be taken at their true value, to be determined by joint representation of each party.

The organization to be made on basis that will meet exigencies and conditions as they may exist at the time. As it is deemed advisable to meet the conditions in Japan, the corporation is to be operated with Japanese control. Changes are, however, to be made therein from time to time, as far as circumstances will permit, looking toward a final equalization of representation and control. The corporation is to be organized under Japanese law. Mr. Harriman, having agreed for himself to operation through a Japanese company, the only open question is as to his associates agreeing thereto, which he believes they will.

To provide for an arbitrator, it is agreed that Mr. Henry W. Dension shall be appointed to fill that place.

^{*}The proposal to finance and build the trans-Siberian railway was made by the Russian government to a well-known railroad engineer in the United States. The terms offered were liberal, but the amount of capitalr equired was so great that it could not be obtained without the aid, or at least the goodwill, of the Jewish bankers and financiers in Europe. They, incensed by the treatment of their people in Russia, declined to co-operate, and the American engineer found it impossible to organize a syndicate that would be strong enough to finance the enterprise in July and were soon completed.

[†]Mr. Stevens entered the Service of the Japanese government in 1883, as counsellor of its legation in Washington. He was soon afterwards transferred to Tokyo, where he became a member of the bureau du protocol of the conference for the revision of treaties between Japan and foreign powers. Between 1887 and 1904 he was engaged in various diplomatic negotiations, and in the latter year he was appointed adviser to the Korean government at Seoul. He was assassinated in San Francisco in 1908 by a misguided Korean fanatic who regarded him as an enemy of the Korean people, although, in reality, he had always been their sincere friend.

In case of war between Japan and China, or Japan and Russia, the railroad shall at all times obey the instructions of the Japanese government in the matter of the conveyance of troops and war materials, and the Japanese government is to compensate the railroad for services rendered and protect it against aggressions at all times.

It is agreed that Mr. J. Soyeda, president of the Industrial Bank of Japan, shall be the medium of communication between the parties hereto.

The including of any outside interests (other) than the parties hereto shall be done only after conference and mutual agreement."

With this memorandum of agreement in his possession, Mr. Harriman sailed from Yokohama in the steamship Siberia on the afternoon of Friday, October 12. He had not accomplished all that he desired to accomplish, but he had at least "started something," and there seemed to be a fair prospect that the concession thus obtained would ultimately lead to the consolidation of Japanese and American transportation interests on the Asiatic mainland, and greatly extend and promote the commerce of the United States in that part of the Orient.

Unfortunately, while Mr. Harriman was at sea, on his way to San Francisco, all his Far Eastern plans were suddenly blocked by an obstacle that he had neither foreseen nor considered. Three days after he sailed from Yokohama, Baron Komura, the Japanese minister of foreign affairs, returned to Tokyo from the United States, bringing the treaty that he and Minister Takahira had just negotiated with the Russian plenipotentiaries at Portsmouth. As soon as the Harriman-Katsura agreement for joint control of the South Manchuria Railway was shown him, he said "It cannot possibly be carried out, because it is inconsistent with Article VI of the treaty that we have just made with Russia." The article in question provided that the transfer of the South Manchurian road from Russia to Japan should be made only with the consent of the Chinese government. Until, therefore, such consent should be obtained, Japan had no legal rights that could be shared with Mr. Harriman. Aside from this, Baron Komura was opposed to the Harriman-Katsura agreement on its merits. The Japanese people were already so dissatisfied with the Portsmouth Treaty that they had resorted to mob violence as a protest against it, and their discontent would be greatly increased if they should learn that their government had sold to a Japanese-American syndicate nearly all that they had gained in two years of successful war. To have made peace without securing a pecuniary indemnity was bad enough; but to sell more than half the fruits of their victory to the Americans, and thus throw open to foreign competition the commercial field which they had bought with their treasure and blood would seem to them intolerable.

Baron Komura's arguments and influence were too strong for the supporters of the Japanese-American agreement, and in less than a week a change of policy was decided upon. When Mr. Harriman, with his mind full of plans for the future, arrived in San Francisco, he received from the Japanese consul there the following note:—

I beg to inform you that I have been instructed by Count Katsura, of my government, to deliver the following message to you immediately upon your arrival in San Francisco:—

"The Japanese government have found it necessary to institute a more thorough investigation and examination of the questions which are the subject of memorandum of October 12, 1905, and they consequently request you to regard the memorandum as in abeyance until they are able to communicate with you more fully regarding the matter."

Ten days later, when Mr. Harriman had reached New York, he received the following cable message from Mr. J. Soyeda, president of the Industrial Bank of Japan:—

Tokyo, October 30, 1905.

E. H. HARRIMAN, New York.

Prime minister requests to forward following confidential message to you explanatory message handed you by Japanese consul San Francisco.

"Having considered detailed report made by minister of foreign affairs on his return home, and having in view pacific attitude Chinese government on railroad question, Japanese government has come to conclusion that question embodied in memorandum, October 12, requires more thorough and complete examination than possible at present time. As you are aware, Portsmouth Treaty provides for consent of China regarding transfer to Japan of railroad property, and for agreement with Russia regulating connecting railroad service. Until agreements with China and Russia are concluded, impossible to determine precisely what rights and properties are included in the transfer, or what earning capacity of railroad is likely to be. Without full knowledge on these points impossible to make definite arrangements for working railroad and property which would prove satisfactory to either Japanese government or E. H. Harriman. Consequently Japanese government deem wise request E. H. Harriman to regard said memorandum as in abeyance for the time being. Japanese government will proceed, as soon as possible, to conclude necessary international agreement. Such agreement will probably necessitate some essential change in proposed arrangement with Mr. Harriman, But in any event, Japanese government will consult him before making arrangement with private capital."

SOYEDA.

This cable message was the result of a compromise between Baron Komura and the supporters of the Harriman-Katsura memorandum. The former advocated immediate cancellation of the agreement, for the reason that it was inconsistent with Article VI of the Portsmouth Treaty. In view, however, of all the circumstances, and especially of Katsura's ignorance of the stipulation regarding Chinese consent, Baron Komura agreed to regard the memorandum as "in abeyance," and to leave open the possibility of confirmation at a later time, provided no objection should be raised by the government of China.

If the Japanese minister of foreign affairs had been previously consulted, and had favored the agreement on its merits, he might possibly have found some means of dealing with the Chinese complication; but he had never met Mr. Harriman and had not been impressed, as had his colleagues, by the latter's forceful personality; he doubted the expediency of sharing control of the South Manchurian road with a syndicate about which he knew little or nothing; and he believed that the agreement, if allowed to go into effect at that time, would increase his own unpopularity in Japan, and would render extremely difficult, if not wholly impossible, the negotiation of the treaty with China that he then had in contemplation. He, therefore, insisted upon postponement, at least, and the other members of the ministry yielded.

In this thwarting of Mr. Harriman's plans there seems to have been no intentional breach of faith on the part of the Tokyo authorities. It was simply a case in which one branch of the government, acting independently, concluded a treaty that nullified action taken almost simultaneously by another branch. Count Katsura did not know that Baron Komura had agreed in Portsmouth to make the transfer of the railroad conditional upon Chinese consent, while Komura, in concluding such agreement with Russia, was ignorant of the Tokyo memorandum. One compact or the other had to be set aside, and in holding the Harriman agreement "in abeyance" while he negotiated with China, Baron Komura thought, perhaps, that he was making the best of an accidental and unfortunate situation. But be that as it may, he started for Peking with Mr. Denison, on November 6, leaving the railroad matter in this unsettled state.

Negotiations with the government of China for a new treaty occupied more than a month, and Mr. Harriman was not informed

of the result until January 15, 1906, when he received from Mr. Soyeda the following cable message:—

Tokyo, January 15, 1906.

E. H. HARRIMAN, New York.

Baron Komura returned on January I and the new cabinet was formed on the 7th. I have been urging the necessity of informing you what to be done, and am now asked to wire you. Count Katsura requests me to let you know that obtaining from China consent contemplated by Article VI Portsmouth, N.H., Treaty it was necessary to provide that Manchurian railway should be worked by company composed exclusively of Japanese and Chinese shareholders, following in that respect terms of original concession to Russia. Count desires me to convey expression of regret that, in view of above circumstance, he is compelled to ask you regarding memorandum of October 12, 1905, as of no effect, as it is manifestly impossible to make any arrangement based on it. He adds, however, that the Japanese government entertain a doubt as to possibility of Japanese and Chinese capital alone being sufficient to meet requirements of necessary improvements and extension of Manchurian Railway, and that therefore should an occasion arise in future enabling them to open negotiations with foreign capitalists, on a different basis, a fresh consultation may be held with you. I desire to add Count has been relieved of his position as prime minister, and send this telegram after consulting with Marquis Saionji, his successor.

SOYEDA.

In a letter written to Minister Griscom in January, 1906, Mr. H. W. Denison, legal adviser of the Japanese foreign office, gave the following explanation of Baron Komura's failure to get the con-

sent of China to the Harriman-Katsura agreement:-

"The Japanese government have secured the consent of China to the assignment of the railroad (the South Manchurian) between Port Arthur and Chang-chun, subject to the same terms and conditions that attached to the original grant to Russia; that is to say, the railroad is to be worked by a company composed exclusively of Japanese and Chinese shareholders. You will find the original concession to Russia in Rockhill's book "Treaties and Conventions with and Concerning China and Korea," pp. 207-224, and I enclose a newspaper copy of the official version of Baron Komura's agreements with China . . . If the Chinese avail themselves of the opportunity of taking half a share in the Manchurian enterprises, a definite understanding on the basis of the memorandum of October 12 is impracticable. There is at the present time a very strong anticoncession wave sweeping over China. The government are endeavoring, by hook or by crook, to get back the grants already made. They cancel the concessions in case of default in any direction, and they buy back the grants if no grounds for cancellation exist. In this frame of mind, and being unable to cancel or repurchase the Manchurian concessions, it is more than likely that China will gladly take the one-half interest in the enterprise. In that case I believe some arrangement on new lines will be possible, but only if the negotiations are undertaken by a man of force and prestige like Mr. Harriman."

In the spring of 1906, Mr. Jacob H. Schiff, of the firm of Kuhu, Loeb & Co., happened to visit the Far East, and, at the request of his old friend and associate, Mr. Harriman, made an attempt to revive the 1905 agreement; but Baron Komura was as much opposed to it as ever, and after a number of conferences the negotiations

were again dropped.

Thus ended Mr. Harriman's attempt to get control, or partial control, of the South Manchuria Railway, as an essential link in his projected round-the-world transportation line. His ill success, however, did not shake his faith in the practicability of the enterprise, but merely led him to consider other means of bridging the gap between the Gulf of Pechili and the trans-Siberian road. The difficulties in the way were very great. A new and independent line through Manchuria or Mongolia could not be built without Chinese consent, and the Chinese, at that time, were strongly opposed to the granting of any more railroad concessions to foreign

syndicates. So far, moreover, as a line through Manchuria was concerned, they themselves were almost powerless, for the reason that, in the treaty of December, 1906, with Japan, they had agreed "not to construct any main line in the neighborhood of and parallel to the South Manchuria Railway." Even, therefore, if they had been willing to let Mr. Harriman build a road from the Gulf of Pechili to the terminus of the Chinese Eastern, they could not do so, because it would necessarily be a "main line in the neighborhood of and parallel to the South Manchurian."

Mr. Harriman thought, at one time, of building a road across the Gobi Desert by the old caravan route, passing through Kalgan and Urga and connecting with the trans-Siberian near Irkutsk; but as the distance would be great—twelve hundred miles or more—and as most of the country to be traversed was so barren as to promise little in the way of agricultural development, this scheme was soon dismissed as impracticable.* The only alternative was a new line, about four hundred and fifty miles in length, from the Gulf of Pechili to the trans-Siberian Railway at Tsitsihar. This road, although nearly parallel with the South Manchurian, would be separated from it by an average distance of one hundred and seventy miles, and consequently would not be in the prohibited "neighborhood."

In the early part of 1906, Mr. Harriman received full reports on the trade, industry, and resources of northeastern China from Colonel Holabird and Mr. Wallace, two experts whom he had sent to make investigations in the Far East; and in that and the following year he was kept fully informed with regard to railroad affairs in Siberia and Manchuria by Willard D. Straight, consulgeneral of the United States at Mukden.†

For a year or more, no opportunity to promote the Far Eastern enterprise presented itself, but in September, 1907, Lord French, representing Pauling & Co., of London, and Mr. J. O. P. Bland, representing the "British and Chinese Corporation," secured from the Chinese government the right to extend the Chinese Imperial Railway from Hsin-min-tun to Fakumen, with the privilege of building, ultimately, to the trans-Siberian at Tsitsihar. As this seemed to open the way for such a Russian connection as Mr. Harriman had in view, Mr. Straight wrote him, in September, 1907, suggesting an alliance with the British syndicate, as a means of securing the essential link in the projected round-the-world line without the cooperation of the Japanese. Mr. Harriman replied by cable, however, in October, 1907, that, owing to the panic of that year, financial conditions were such as to prevent the raising of the necessary funds.

In the summer of 1908, when the financial situation in the United States had somewhat improved, Mr. Harriman decided to make another move in the Far East, and requested Secretary Root to recall Consul-General Straight, in order that American capitalists might discuss with him the expediency of making a loan to China for agricultural development and railroad construction in Manchuria.

^{*}It is not certain, however, that even this line would have been unprofitable. The Chinese themselves afterward began the construction of four hundred miles of railway along this route, and on the Peking-Kalgan section, which was completed in 1912, the net profits of operation in 1913 were twenty per cent. on the investment.

[†]Mr. Straight was a young graduate of Cornell University whose acquaintance Mr. Harriman made in October, 1905, at the house of Edward Vernon Morgan, American minister to Korea. Mr. Straight was then viceconsul-general in Seoul, but he had previously been correspondent of Reuter's Agency and the Associated Press in Korea and Manchuria and had spent two years in the service of the Chinese imperial maritime customs at Nanking and Peking. He impressed Mr. Harriman as a young man of character and force, and one whose ability and experience might make him a valuable assistant in such an enterprise as that which was then in contemplation. When the American legation in Seoul was closed, in the fall of 1905, Mr. Straight went with Minister Morgan as private secretary, and when Mr. Morgan was appointed minister to Cuba in 1906, he accompanied him to Havana. A few months later the state department transferred him to China and made him consul-general at Mukden. On his way back to the Far East, in the summer of 1906, he spent a week-end at Arden, where Mr. Harriman discussed with him the railroad situation in Manchuria and arranged to keed in touch with him by means of correspondence.

Meanwhile Mr Straight had secured from Tang Shao-yi, the Chinese governor at Mukden, a signed memorandum of agreement which was to form the basis of negotiations for a loan of \$20,000,000. With this sum it was proposed to establish a Manchurian Bank, which should co-operate with American and Chinese interests in the construction of a railway from Tsitsihar to Aigun. Then, if the bank and the American capitalists could come to an agreement with Pauling & Co., who had the right to build a road southward from Tsitsihar to Hsin-min-tun, it would be possible to construct a trunk-line from the Gulf of Pechili to the Amur, and thus bridge the gap between the Pacific Ocean and the trans-Siberian road.

In September, 1908, Consul-General Straight returned to the United States, bringing with him the memorandum of agreement with Tang Shao-yi for the \$20,000,000 loan. Through the influence of Mr. Harriman, and with the cognizance and approval of the secretary of state, Kuhu, Loeb & Co., agreed to undertake this loan, provided all the details thereof could be satisfactorily arranged. Late in November, Tang Shao-yi came to Washington, ostensibly to thank President Roosevelt for the remission of part of the Boxer indemnity, but really, in great part, to negotiate the proposed loan for the establishment of the Manchurian Bank.

Here again, however, Mr. Harriman's plans were blocked by events that could not possibly have been foreseen. Tang Shao-yi's appointment had been made through the influence of his friend Yuan Shih-kai, who was then grand councillor and head of the Chinese foreign office, and who was greatly interested in securing American capital for the development of Manchurian resources. About the middle of November, 1908, both the emperor and the empress-dowager of China died, and Prince Chun, an enemy of Yuan Shih-kai, became regent. This undermined Yuan's power, and led, a few weeks later, to his dismissal from office. Tang Shao-yi, thus left without support at home, became discouraged, and the matter of the loan was allowed to drop.

Mr. Harriman, however, continued his negotiations for the

acquirement of a Manchurian line, both with Russia and again with Japan. In the summer of 1909, after he was stricken with mortal illness, he secured a promise from the Russian minister of foreign affairs, Mr. Kokovtsef, that upon the latter's return from a trip that he was about to make to the Far East, he would recommend the sale of the Chinese Eastern Railway to American interests. But even this partial success came too late. On September 9, Mr. Harriman died, and there was no one left in America capable of undertaking, much less of carrying through, such a colossal enterprise as the establishment of a round-the-world American transportation line. Whether the "Master Builder" himself could have accomplished it, if he had lived, it is impossible to say; but the results of successful accomplishment might have influenced profoundly the world's history. No one who has studied Mr. Harriman's constructive and administrative methods can doubt that if he had ever acquired even partial control of the trans-Siberian railway, he would have doubled or trebled its carrying capacity. Then when the great war of 1914 came, Russia would have been able to draw heavy artillery and ammunition from Japan and America over an efficient through line of great capacity, and would not have been reduced to such straits as she was when her troops, largely without proper weapons and almost wholly without reserves of ammunition were forced out of Poland and driven halfway to Petrograd. Her defeats in the war with Japan in 1904-05 were mainly due to the inadequacy of the trans-Siberian road as a means of speedy transportation, and her reverses on the German frontier, ten years later, were due, in part at least, to the same cause. During the winter and spring of every year, the railroad to the Pacific was her only open line of communication with the outside world, and it never was in physical condition to meet the demands made upon it. If, reconstructed and re-equipped by Mr. Harriman and the American syndicate, it had been made part of a great international transportation system, it might have become the decisive factor in the struggle with Germany in 1914-15, and might thus have changed the earlier stages, if not the whole course, of the great world war.

The Kwantung Lease

Throw On The Limelight

Weale" on Chinese political questions. However, we confess that the most enlightening contribution from the Chinese official side to the controversy with Japan over the legality of the Kwantung lease, comes from his pen in an article entitled "The Story of the Twenty One Demands." Mr. Simpson bears out our contention that the truth about the demands remains to be told. We have invited attention to the conflicting stories emanating from Tokyo and Peking which disclose that the ultimatum was invited by Yuan Shih-kai to save his face before the nation; that there was some sort of secret understanding between Yuan and Okuma in which the former contributed funds to the latter's political campaign in Japan in exchange for a promise to support his restoration of the monarchy.

We have since learned from the highest authorities in Tokyo that it was Tsao Ju-lin, the vice-minister of foreign affairs in the Yuan government, who personally visited the Japanese legation and requested Minister Hioki on behalf of Yuan to present the ultimatum. We have also learned on equally good authority of the existence of a signed statement of Marquis Okuma which corroborates the above story and throws further light on the negotiations of 1915. This was in the form of an interview for the American press, a copy of which was submitted to a foreign newspaper in

Japan and rejected. The signed statement, however, is still in existence in the original Japanese bearing Okuma's well-known signature.

In presenting his version of the demands, Mr. Simpson says:

"The Japanese had quite accurate information regarding the monarchy plan almost before Yuan Shih-kai himself was thoroughly aware that his inner circle had determined to make him emperor or wreck the country in the attempt. His opposition to Japan was expressed in such a form that it was easy to take advantage of a moral vulnerability which could only arise through treachery. Treachery to the republic had been settled upon in Peking; that is why in the preamble to the Twenty-One Demands (which has never been published in its complete form and probably never will be) the Japanese told him plainly that as he was virtually emperor it rested with him either to enlist the decisive factor—Japan—on his side or take the consequences.

"Had he been really a bold man and politically honest, he would have taken the consequences, and circulated as fast at printing presses could print millions of copies of the Twenty-One Demands until the heavens and earth were filled with them. That was his one last chance. He missed it. The secrecy enjoined upon him which he officially preserved was the silken cord which finally strangled him. Imagine any man allowing himself to be murdered in a room, with the windows open and 400 million people outside

unless he is in some way an accessory!

"Thus the position at the very start was not what the Chinese people have been taught to believe. The treachery (if it is necessary to employ such strong word) was not on the side of Japan. The Japanese having been rudely challenged, as they considered, after having more or less unwillingly captured Tsingtao were determined to see who was master in the region of the Far East. And they proceeded to work on lines which were not exceptional since they had done the same thing in Korea . . . That in addition to the formal negotiations, Yuan Shih-kai was carrying on private soundings in Tokyo need not be doubted."

Mr. Simpson admits that the real treachery was on the part of China, that Yuan and his intimates had determined to betray the republic. With this truth established, it is natural than they should seek recognition when the coup was ready to spring. It also seems natural that they would have to pay the price for such recognition. This would explain the secret preamble mentioned by Mr. Simpson in which the Japanese told Yuan plainly that he was the emperor, and as such weilded the power to accede to the demands. Mr. Simpson's admission incidentally fully bears out and vindicates the attitude of Dr. Sun Yat-sen towards the Peking traitors to the republic and lends substance to Sun's own version of how the demands originated.

In concluding his story, Mr. Simpson says:

"I, however, am one of those who do not think it necessary for China and Japan to be enemies. It is bad for business and bad for human progress. I would like to see a Sino-Japanese commission nominated to sit in Tokyo to study the question of Manchuria in particular and railway building generally in the Chinese domain,—since that is what the remnant of the Twenty-One Demands amount to. It would be easy to transfer the territorial lease of Port Arthur into a Dairen municipality, just as it would be easy to make the Hanyehping enterprises into a proper railway-building centre with every nation interested. A little more imagination should be shown on both sides. Sending communications about non-validity (or cancellation) of documents does not modify the actual position which has nothing to do with paper or parchment."

This appears to be the only sensible statement that has come from the Chinese official camp, revealing as it does a disposition to effect a friendly compromise to an issue that until clarified, will remain a bar to harmonious relations. It must be admitted that Japan's answer to China's note announcing the cancellation of the 1915 treaty, is as unconvincing as the Chinese argument. The demands and treaties arising therefrom are difficult to justify even if it be proven that Yuan Shih-kai was willing to pay the price for Japan's recognition to a restoration of the empire. As far as the Kwantung lease was concerned—and this was the crux of the demands—it is well known that its extension to 99 years was agreed to by Yuan without serious discussion or opposition. As Mr. Simpson says in his version:

"The actual negotiations conducted in Peking by the Foreign Minister, Lu Cheng-hsiang, assisted by Tsao Yu-lin, vice-minister, are easily summed up. Yuan Shih-kai had not only made up his mind to give way on Shantung and Manchuria long before the ultimatum but all the details had been settled by the beginning of April. This wrote off Group I (Shantung) and Group II (Manchuria) which were placed on an uniform 99-year leasing system. Group III, which was the Hanyehping iron and steel enterprises on the Yangtze, and Group IV, which was merely a declaration about non-aliention of Chinese territory, were unimportant in themselves. Group V, the sketch of the proposed Japanese protectrate, was, of course, the hard nut. From first to last the real struggle was round this question. How little real importance was attached to Manchurian issues can be proved by the fact that when years later I was called upon to write a memorandum defining the geographical limits of South Manchuria based as far as possible on treaties and documents, I found it necessary to visit the senior delegate, Lu Cheng-hsiang, to ask him whether there was any map of the mining-areas conceded in the exchange of notes of 1915 as I was unable to find a certain area mentioned therein. He answered that the place I named existed because he had telegraphed an inquiry to Mukden at the time and they had replied that they know of the locality. That it is the way the Manchurian issue was dealt with."

This relieves the Japanese from the charge that their position in Kwantung was obtained by the application of the ultimatum, and as this is all that remains of the demands, it weakens China's case on this point.

In responding to the Chinese note, the Japanese diplomatically understated their position by adhering closely to the advice of the late Mr. Henry W. Denison given during the negotiations which preceded the war of 1905. The Japanese answer to one of Russia's notes was couched in terms which revealed a determination to support their position by arms. When the note was brought to Dension for perusal and comment, he asked: "are you ready to go to war"? "Yes, if necessary," was the reply. "Then rewrite your note and make it mild," was Denison's comment. Japan, therefore, intentionally worded her reply to China in the mildest possible terms. The difference between the two cases, being that Japan has no intention of going to war with China over Kwantung unless China herself should precipitate a situation that would force Japan to act. Japan has fought two wars for the possession of this territory, one against

China alone and the other against China and Russia acting as allies. She is willing to fight a third, if needs be, but in this case, she is in possession of the territory and the war will have to be forced upon her.

From all appearance, Japan rejects any overtures for further discussion as to the right of her permanency in Kwantung by any Sino-Japanese commission or international convention. China cannot submit her case either to the league of nations or the Hague tribunal unless Japan consents. This she refuses to consider. She stands squarely upon the validity of the 1915 treaty and says in effect, that her right to Kwantung was definitely settled as a result of the war with Russia, in which China was allied with her enemy and provoked the conflict by her double-dealing. If Japan's position under the 1915 treaties is weak and her arguments un. convincing, she is correspondingly invulnerable and unassailable when she goes behind the twenty-one demands and rests her case on China's alliance with Russia which precipitated the catastrophe of 1905, and from which, by reason of the most profound secrecy surrounding the alliance, China escaped paying her share of the indemnity.

China had her revenge for the humiliation of 1895. Her secret alliance with Russia, the text of which has been officially revealed after many years, brought the latter into Manchuria for the express purpose of destroying Japan. She escaped paying the penalty in 1905 at Portsmouth. The facts are now known and Japan is in possession of Kwantung; bought at a price which staggered humanity at the time. Japan paid the price exacted as the result of China's treachery, and if China now wishes to attack her from the hard won position, she will have to pay a greater price that mere denunciations of treaties, commercial boycotts or student street parades.

A remarkable fact connected with the agitation surrounding the cancellation of the 1915 treaty, is that no Chinese newspaper has seen fit to aquaint its readers with the truth concerning China's secret treaty of alliance with Russia signed in 1896, which brought Russia into Manchuria and handed over the railway concessions and territorial lease so that Russia could be in a position to attack Japan. This is not an alleged treaty as the leading anti-Japanese newspaper of Japan would have us believe; it preceded the signing of the Chinese Eastern Railway concession and other agreements which gave Russia dominant rights in Manchuria. Its authenticity has been officially acknowledged by China and the text filed at Washington during the disarmament conference. It is the key to the puzzle, the starting point of modern Far Eastern history, the instrument that set the ball rolling and automatically made the Anglo-Japanese alliance a vital necessity to the security of Asia. Starting from this date, and with this treaty as the basis, all subsequent moves on the Far Eastern political chessboard are intelligible to even the most superficial reader. China's own duplicity, weakness and disorganization, are solely responsible for her international troubles.

It is time to stop beating around the bush. The world and China demands the facts; all the facts. Although standing upon the validity of the treaty signed as the outcome of the twentyone demands, Japan, as a matter of form, and to avoid further humiliation of her weaker neighbor, is prepared if pushed to extremes, to call China to account for her crime of 1896 which made possible the war of 1905, and to demand tardy reparation for the sacrifices imposed on her by the alliance with Russia. Is China prepared to face this issue? Is she prepared to square her accounts with Japan and admit her culpability for the war of 1905? If so, there is only one compensation that Japan will exact—the recognition of the leasehold over Kwantung for 99 years. Unless China recognizes this just position of Japan, or insists upon constantly raising the question of the legitimacy of her right to the Kwantung lease without any attempt to atone for her own treachery, a situation may well be created that would compel China to pay even heavier damages than those she is now called upon to face by Japan's occupation of the strategic key to

Manchuria. Japan has answered China very meekly. There is a meaning to this meekness which China should not misinterpret.

Perhaps Japan would be willing to enter into some compromise with China over this matter, but it is a foregone conclusion that such compromise will have to based upon China's frank and open acknowledgement of the part she took in bringing about the Russo-Japanese war and a recognition of Japan's sacrifices which terminated Russian imperialism in the Far East and restored the Three Eastern provinces to Chinese sovereignty. Once the present generation of Chinese are educated to the part played by Li Hungchang and the old Manchu mandarinate in forcing the war with Russia upon Japan through the medium of a secret alliance, the way will be cleared for a permanent peace in the Far East. Count Witte confesses in his memoirs that he bribed Li Hung-chang by the payment of 500,000 roubles for the lease to Kwantung, which provided Russia with the strategic base from which to conduct her war plans upon Japan. The Chinese should be told these facts by their publicists, and as the full truth becomes known, the way will be cleared for a better understanding of Japan's real position. Constant harping on the twenty-one demands, which reflect no credit on either Japan or China, cannot help towards a solution to this problem. The roots of the question go down deeper, and until the Chinese are permitted to see that these roots are embedded in the mud and filth of the old Manchu doublefaced diplomacy of the last century, and which gives to Japan a legitimate grievance against their rulers, there can be no hope of a proper solution to the Kwantung question.

Proposed Chinese Cotton Mill Loan

IT has been known for some time that many new Chinese cotton mills erected during the boom period on long term credits for machinery and plant have been having a hard time, but it comes as a distinct shock to learn that these conditions have reached a point where a loan guaranteed by the government is deemed necessary to save them from going under. It is furthermore regrettable at this crisis in the financial affairs of the country that the promotors of the loan look forward to placing the bonds on the foreign market secured by a special surtax of one tael on each bale of yarn and guaranteed by the government from the proceeds of the increased customs revenues agreed to by the Washington conference. The disbursement of the loan, should it be issued, is to be supervised by the inspector-general of customs and the representatives of the Chinese and foreign banks interested, in other words, a further charge on the customs surtax, which, to all appearances, is to bear the burden of redemption for all of China's unsecured obligations. The depression in the cotton goods trade is so marked that the cotton mill association at Shanghai has requested its member mills to reduce their spindles in operation to half the present number or suspend night work in order to limit production, a marked contrast to the activity in Japan where the leading mills are doubling their equipment in order to eliminate night work.

In presenting the petition to the government, outlining a plan for floating a loan of Taels 30,000,000 the cotton mill association invites attention to the rapid development of the cotton industry in the past few years. In 1917 the total number of spindles in the different cotton mills was about 700,000 and at present the figure has swollen to over 2,000,000, with an increase in assets from Tls. 30,000,000 to Tls. 100,000,000.

The rise in the exchange rate of gold and delay in the delivery of machinery by foreign firms has caused serious losses to the mill owners, civil strife has been responsible for business stagnation and the failure of the cotton crops last year, sent up the price of raw cotton and placed the mills in a more difficult position than ever. If present conditions prevail, the mills, will, in a year or so, be compelled to close and a large number of the half million workers now employed thrown out of employment.

In order to find means to relieve the situation, the petitioners inform the government that a syndicate should be organized to raise funds to finance the mills by issuing debentures, in Europe, America and the home market. Three advantages, they claim, can be derived from the organization of such a syndicate, namely: (1) the syndicate itself needs no current capital; (2) when the banking business of the syndicate is confined to the cotton m!lls alone, it is easy for the syndicate to watch and study the financial standing of its debtors and (3) that the syndicate will form a medium between the cotton mills which have surplus wealth to invest, and the mills which need capital.

The petitioners state that their plan has been endorsed by foreign financiers but in order to put it into execution the government is asked to exempt raw cotton from likin, and levy a special surtax of one tael on each bale of yarn, such surtax to be used as security for the redemption of the debentures. The management of the mills which make use of the loan proceeds for their capital will be subject to the supervision of the syndicate. Loans made to the mills by the syndicate will be redeemable by yearly instalments. The syndicate on receipt of such repayments from the debtor mills will use the proceeds to redeem debentures. According to the plan, the entire amortization of the Tls. 30,000,000 loan covered by the debentures will be completed in eighteen years. The government is requested to guarantee the redemption of the loan, because when it is secured on government revenue, its credit will be enhanced in the eyes of the public and the issue of the debentures will be facilitated.

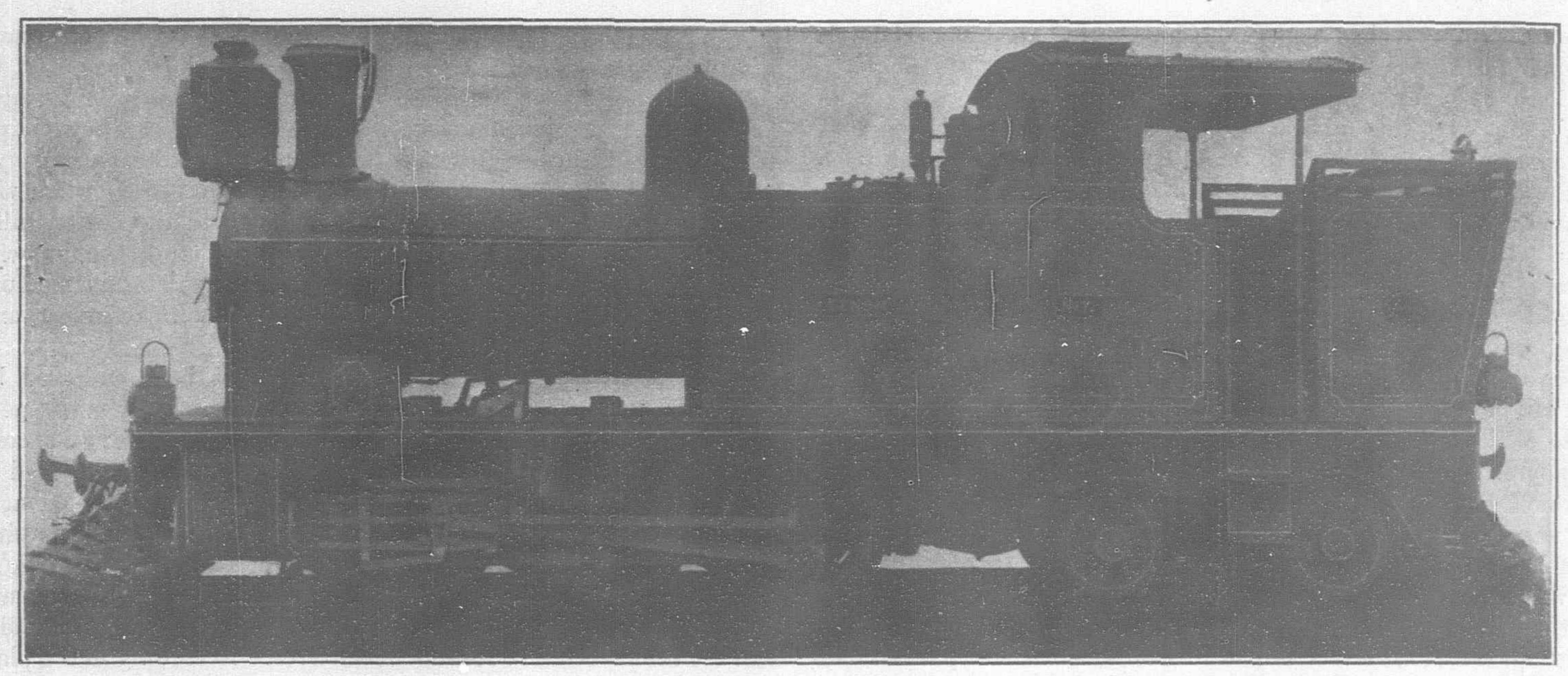
In describing the conditions which brought about the present depression, the cotton mill association makes no mention of the distressing consequences attendant upon the operations of the many wild cat exchanges which sprang into existence last year, inducing unprecedented speculation in all commodities and materially contributing to bringing the price of yarn to its present low level. In the actual condition of Peking finances it is hardly probable that such a loan will receive official sanction without some "gratuity" to the ministries who must authorize its issuance. We hear rumors (denied by the cotton mill association) to the effect that a sum of Taels 150,000 will be paid to the minister of agriculture and commerce as commission, and that \$8,000,000 will be allocated from the proposed loan to the same ministry for "industrial development," etc.

Electrical Course in St. John's University

A PRACTICAL course in the problems of operating electrical machinery in factories has been started in the science hall of St. John's University. The course is conducted through the industrial department of the Y.M.C.A. and will be open to all Chinese assistants in manufacturing and industrial establishments in the Shanghai district. E. L. Clark, E.E., and M. H. Pai, E.E., both graduates of the Massachusetts Institute of Technology, will have charge of the instruction which will take the form of weekly lectures and practical demonstrations. The fee for the entire course will be \$5 payable in advance at the Chinese Y.M.C.A.

The real purpose of the course is to provide needed instruction in practical electricity for shop men and foremen who have the actual handling of motors in factories. Technical schools have provided and are providing instruction for the engineers and superintendents at the top, but there has always been a need for practical instruction in the actual handling of electrical appliances for the considerable number of assistants in manufacturing institutions. Practical instruction along the lines indicated will constitute an excellent investment for the owners and managers of manufacturing enterprises, for it often happens that ignorance on the part of some employee can cause great losses.

Mr. Clark who will have charge of the actual demonstrations is connected with the International General Electrical Company of Shanghai.



Type of Engine Used on the North Borneo State Railways. Made by the Hunslet Engine Co., Ltd., of Leeds

Railways and Roads in North Borneo

By G. C. Irving

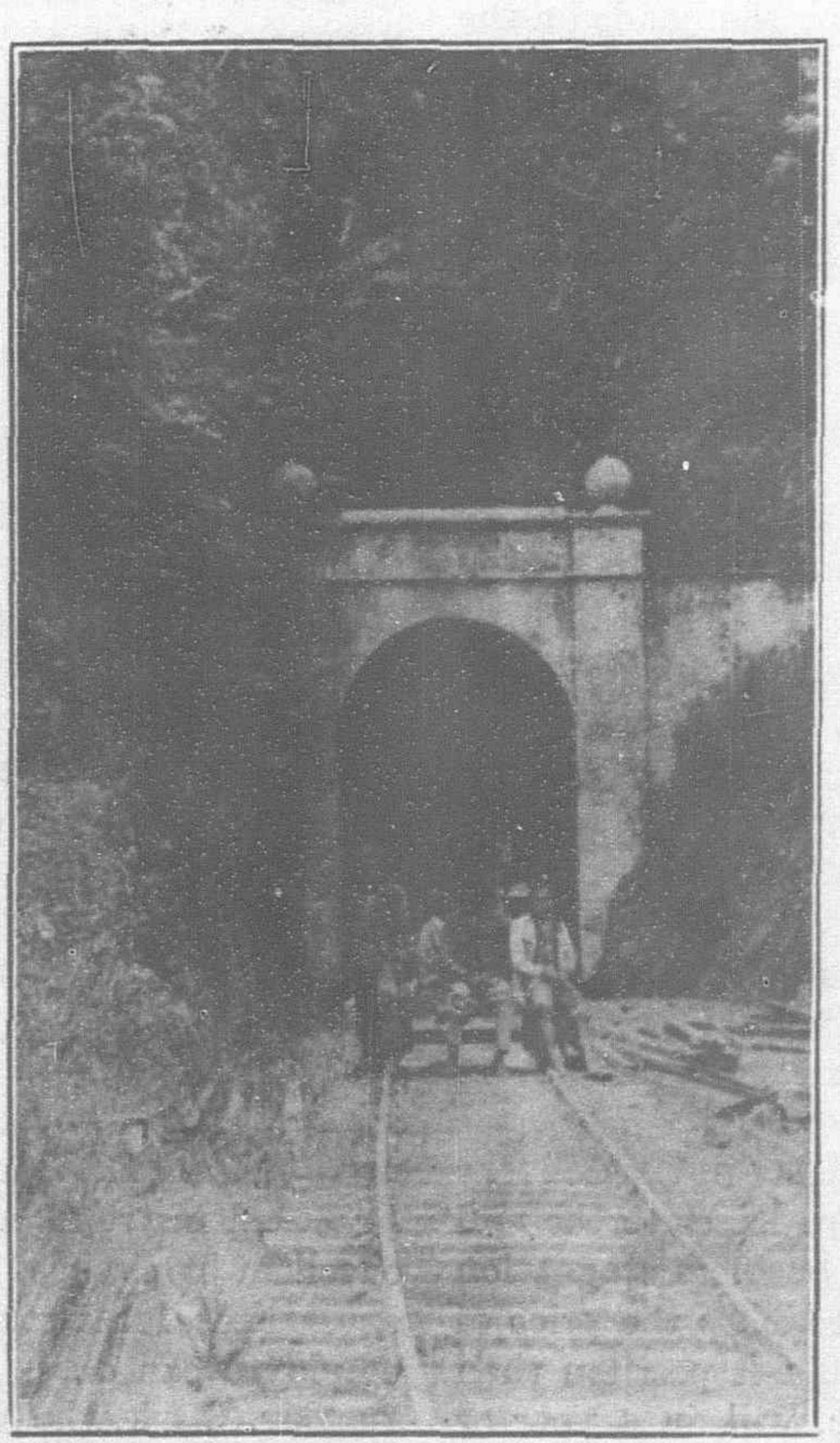
CRITICISM that casual visitors never fail to include in their impressions of Borneo is the absence of roads, and the criticism is not confined to visitors for our own people lose no chance of taking the government to task for its neglect of development in this respect. A study of the history of development in Borneo will answer critics, though possibly it may fail to satisfy them, and will show how one thing has led to another until to-day the construction of roads has been given a prominent place in the program of future development.

When North Borneo came into British hands there was nothing in the form of overland communications beyond the mountain trails used by war parties. Owing to the head hunting propensities of the interior tribes, travel was too dangerous to be popular and any such thing as inter-village trade was unknown. The pioneers of civilized government made their headquarters on the principal harbors around the coast and pushed their influence towards the interior by means of the numerous rivers which flow from the central ranges. The early years of the British settlement were occupied in the pacification of native tribes to reach whom the government officers were content to use the native trails. The plantations that came into existence were all situated upon the banks of rivers which provided adequate and inexpensive transport. In these circumstances, added to the fact that the chartered company was not over blessed with cash resources there was no incentive to open roads. Matters remained in this state until late in the nineties when attention was turned to the advisability of opening communication through the well populated villages of the west coast with the promising country that had been discovered in the

interior. In the discussions that took place before the policy of building a railroad was adopted there is no doubt that the advocates of roads hotly opposed the railway scheme. It is understood that Mr., now Sir Hugh, Clifford, who was governor of Borneo at the time, was a strong supporter of roads but the decision of the court of directors went against him. Thus there came into existence in about the year 1899 the British North Borneo State Railway which, built in two sections meeting at the little township of Beaufort, penetrates the interior as far as Melalap in the valley of the

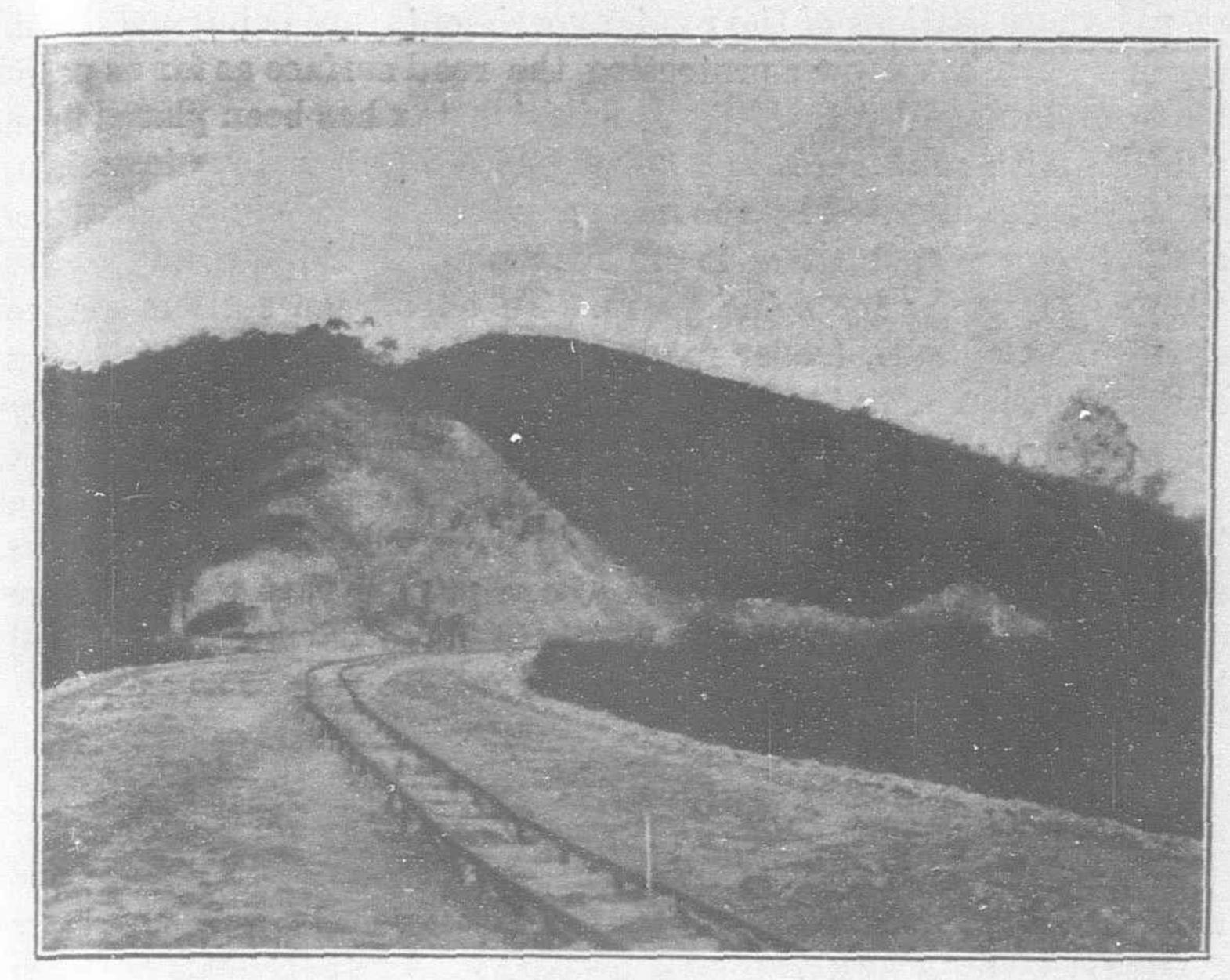
river Padas. This railway which is a single line, metre gauge system connects Beaufort and the interior with the port of Jesselton whilst the branch section extends from the same junction to the diminutive port of Weston at the mouth of the River Padas. The total length of line is about 120 miles of which 56 miles between Beaufort and Jesselton follows the coast line. As an experiment, for such the State Railway must be considered, the policy must be judged by results. Before it came into existence the government revenues from the residencies of the west coast and interior were a negligible quantity; to-day they represent a total of \$500,000.00. This revenue has grown from, among many sources, a land settlement scheme for native lands, the immigration of Chinese and the opening of rubber estates during the rubber boom of 1910. It is only just to say that the increase in revenue has been a direct result of railway development. Against this it has to be admitted that the railway has been a constant drain upon the revenue for it has so far failed to make a profit or even to pay its way.

Disappointment has been experienced in the two principal types of produce that were calculated to provide freights; these were lumber and jungle produce. The

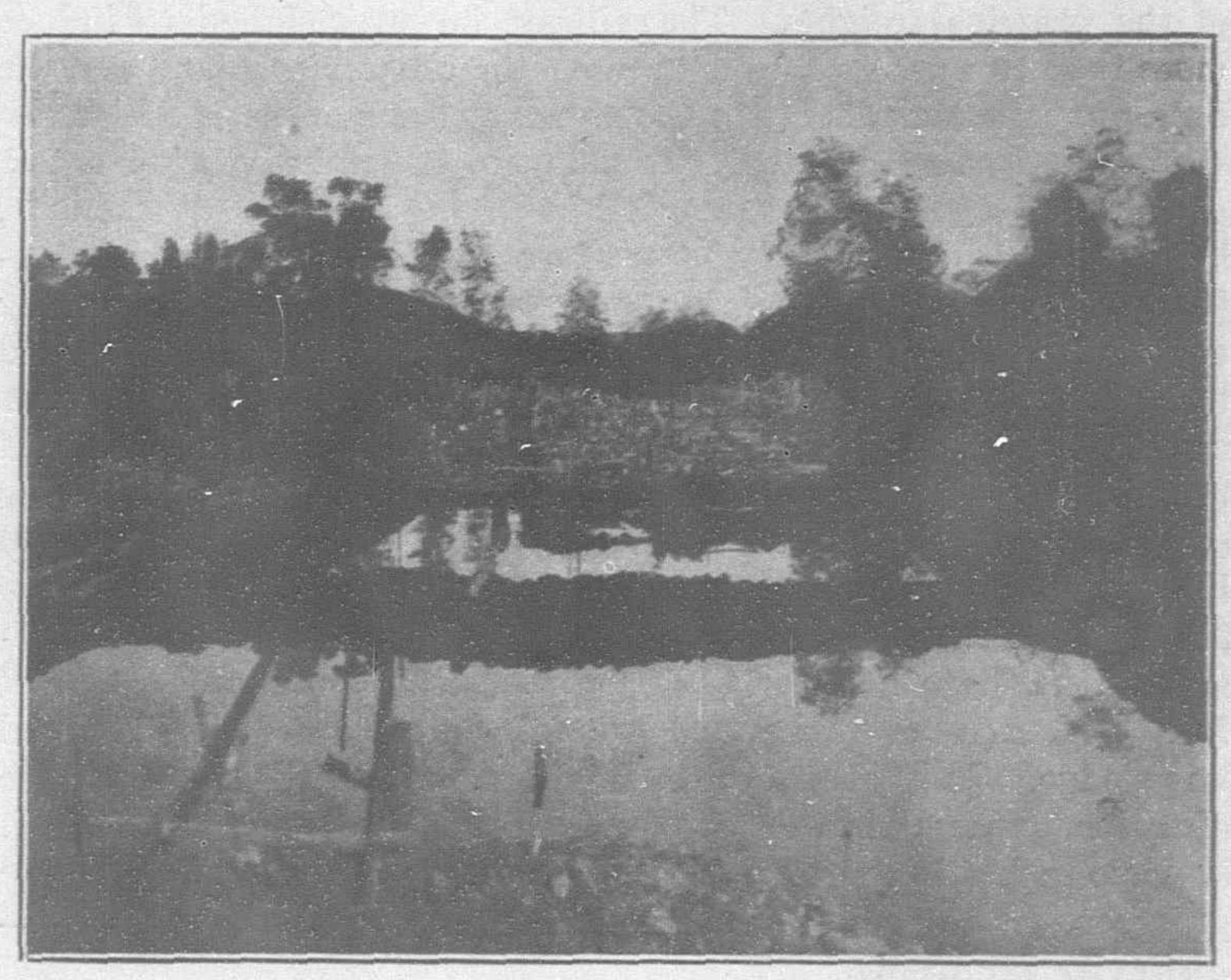


Pengalat Tunnel, 600-ft. long on the North Borneo State Railways

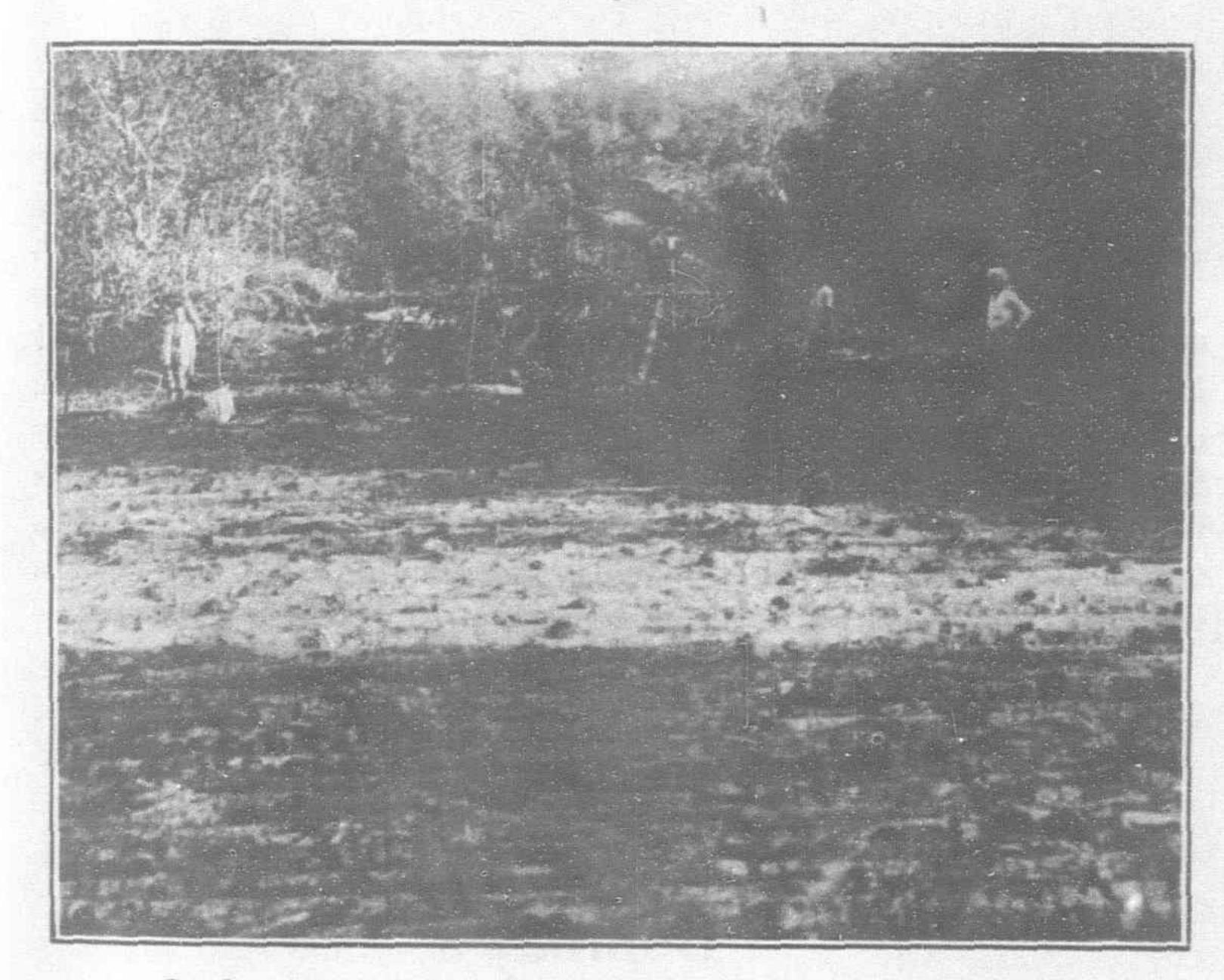
THE JESSELTON TUARAN ROAD IN NORTH BORNEO



Through the Likas swamp showing portion of corduroy road. Timber logs; bed of stone or coral on topside retaining walls and earth filling completed except for metalling



Likas Swamp. View from Tuaran end up to finish of corduroy: excavation of 3-ft. to 4-ft. of swamp material and refilling with spoil



Corduroy foundation of greeling timber over deep swamps



Likas Swamp. View from Likas River to commencement of corduroy: stone retaining walls on each side, built on corduroy

reasons given for the failure of the timber trade are the heavy cost of production in comparison with the east coast, where lumber is carried by river and sea to the mill, and the fact that the railroad was of too light a construction and the rolling stock inadequate for hauling of heavy freights. The loss of freights in jungle produce, principally rattans and 'damar' was due to a miscalculation of the productivity of the forests of the interior and to the ignorance of the fact, in those days, that much of this produce found its way across the border into Dutch Borneo. Another and serious loss of freights was the failure to produce wrapper leaf



Double culvert: Jesselton-Tuaran Road

tobacco in the interior at a profit. Two large estates were opened in 1902 and 1903 which, if successful, would have exported annually large crops of tobacco, a paying and bulky freight. This tobacco proved a failure on the Amsterdam market and the estates were only saved from extinction by the boom in rubber which they both now produce in considerable quantities. There are sixteen rubber estates on or near the railway line; these estates provide the majority of freights which up to now have failed to fill the capacity of the railway. As the track runs through a portion of the sago-producing country, known as the Klias

peninsular, it was confidently anticipated that sago flour of which about 3,000 tons are exported annually, would form one of the principal freights. The railway, however, failed to induce more than two or three firms to move their factories inland and the bulk of the trade adheres to the rivers at the mouths of which the sago factories are situated. To sum up, the railway, after a test of twenty years, has not succeeded in paying its way. Without it, however, it is doubtful if the western part of north would be enjoying anything like the revenue that it does. We are not going to argue from the point of view of roads as to whether roads would have produced better results, for the good reason that our arguments could not be founded on any known data. At the beginning of the century mechanical road transport was in its infancy and the creation of colonial railways was a policy which was being pursued in almost every wild country. Borneo was merely following the fashion. At the time of writing this article the complete re-organization of the State Railway has been accomplished on the advice of Mr. F. W. Barrow, a railway expert of wide experience and special knowledge. It has resulted in a considerable decrease in service of trains, economy in the use of rolling stock and drastic reduction in personnel. As there are clear signs of improvement in trade the prospects for the railway under strictly economical conditions are distinctly promising.

Roads

Up to the year 1920 North Borneo had no roads at all with the exception of town and suburban roads in Sandakan (the capital) and Jesselton. During and after the rubber boom the question of extending the railway beyond Jesselton to the north was under discussion. It was during Sir West Ridgeway's first visit to the territory that the suggestion of a road to cross the country from Jesselton to Sandakan was first mooted. This was jumping with a vengeance from a policy of no roads to a very ambitious scheme in the opposite direction. We need not recapitulate the long discussions that followed, suffice it to say that as a policy the trunk road has received approval and has been in operation for the past two years. Road construction was started in 1920, a year which produced the most promising results in trade and revenue, so that everyone looked forward to a real hustle in development.

Hopes were raised even higher by the granting of a rubber concession of 100,000 acres near Sandakan which was located on the line of the new road. Alas for human hopes, the slump of 1921 brought such schemes tumbling to the ground. The expansion of rubber planting vanished into their air, retrenchment fell upon development schemes of every description and amongst them the first to feel the result of the slump were the new roads. In 1922 little was done beyond the completion of earth works in hand and a modest program of metalling. The present year has opened with a promise of some further advance which is calculated to complete altogether about forty miles of road of lighter construction and a narrower surface than was originally intended. Even this is a step in the right direction for it will open up several thousands of acres of good land and bring more motor transport into the country. In the latter respect there has been, for such small towns as Sandakan and Jesselton, a very big increase in the use of mechanical transport. Without giving exact figures there must be about forty cars of various makes of which the Ford and Dodge are the favorite and are certainly the most suitable. As the roads extend, the demand for cars will have a proportionate increase which will justify the road policy at once from a traffic point of view.

In matters of construction the road from Sandakan has presented no serious difficulties beyond a scarcity of good stone for metalling. The Jesselton-Tuaran road on the contrary roes through sections of swamp which have required expensive foundation work, whilst numerous small rivers have called for a heavy program in bridge building.

For road surface a hard sandstone was used where quarries could be found within easy distance of the road but latterly on the more remote sections of the road experiments are being made with coral. With a view to protecting the road surface as far as possi. ble from damage by traffic a prohibitive tax has been placed upon vehicles with solid tyres and those exceeding four tons in weight. This policy is dictated by the necessity for economy in construction and upkeep whilst there is no reason to anticipate any heavy volume of traffic for some years. To encourage settlers and to open up new lands, feeder roads are to be made as circumstances and expansion dictate until the present roads are carrying their maximum load when the question of improving or widening the surface will be reconsidered. Our road policy must go hand in hand with immigration without which there will be a lack of settlers to take up land. It has already been proved that the roads are causing a rise in land values which in some cases have changed hands at 100 per cent. over prices that ruled a year or so ago.

Bridle Paths

This article would be incomplete without a reference to the work that has been done during the last twenty years in linking up districts by a system of bridle paths. In the old days travel across country could only be accomplished by following native trails or the beds of rivers. If the native tribes were ever to be brought into closer touch with the government means had to be found for making travel quicker and safer. For years district officers have pushed the construction of these six-foot bridle paths into the most remote parts of the interior until to-day there are no less than 800 miles of good track along which a pony can be taken at a canter.

Without them our native tribes would in many cases still be comparative strangers to us and we should not be able to boast that head hunting raids are a thing of the past. The maintenance of our bridle path system is a heavy item of expenditure, especially in districts where little or no revenue is to be got in return; as they are well graded it will be a simple matter should circumstances call for it to widen them sufficiently to carry light traffic; as it is they are not suited to anything but pony and pack transport.

Powerful Grab Hopper Dredger for Bombay

MESSRS. Wm. Simons & Co., Ltd., launched complete ready for work from their yard at Renfrew on March 19 the twin-screw 1,500-ton hopper dredger Chelura, fitted with four Priestman grab cranes for dredging to a depth of 60 feet below water level.

The vessel is propelled by two sets of triple-expansion directacting surface condensing engines supplied with steam from two cylindrical multitubular boilers constructed to Lloyd's requirements for a working pressure of 185-lbs. per sq. inch and of sufficient power to obtain a speed of nine knots per hour in loaded condition.

The dredger is fitted with a novel arrangement of mooring jets for controlling and regulating the position of the dredger when at work. The engine room outfit includes all the most modern fittings and independent steam mooring winches are fitted at bow and stern. The hopper doors are controlled by hydraulic appliances for raising and lowering. Suitable accommodation is provided below deck forward for crew and on upper deck aft for officers.

The vessel with its machinery has been constructed to the highest class at Lloyd's and has been designed and constructed under the direction of Messrs. A. J. Barry & Partners, Consulting Engineers and Agents to the Bombay Port Trust, 2 Queen Anne's Gate, London, S.W. 1.



36-Ton Breakdown Crane for the S.N.R.

Built by Messrs. Joseph Booth & Bros. Ltd.

ESCRIPTION of 36-ton steam breakdown crane built for the Shanghai-Nanking Railway by Messrs. Joseph, Booth & Bros., Ltd., Union Foundry, Rodley, Leeds, to the designs and specifications of the railway consulting engineers, Messrs. Sir John Wolfe Barry and partners of Westminster, London.

The crane is capable of running on a train up to 45 miles per hour.

The normal capacity of the crane is

36 tons at 20-ft. radius.

26 ,, ,. 24 ,, ,,

20 ,, ,, 29 ,, ,,

15 ,, ,, 32 ,, ,,

With the draw girders out and the screw jacks blocked when the draw girders are out to the maximum distance the screw jacks are 15-ft, from centre to centre.

There are also four rail clips to secure to the rails in case of necessity.

The hoisting rope is 4-in. circumference and 230-ft. long and the derricking rope 3.75-in. circumference and 280-ft. long. The hoisting rope is wound on a cast iron barrel with 25 right-hand grooves, being driven through machine cut cast steel gearing from the engine shaft and arranged for hoisting, slewing, derricking and traveling. The hoisting machinery is mounted on a strong plate frame carried with the jib on a cast steel bottom swivel 9-in. 9-in. diameter.

The bottom swivel is driven by a cast steel pinion coupled through bevel gearing and friction clutches on the main engine shaft and meshing into a circular rack on the periphery of the roller path immediately beneath, the swivel revolving on 36 mild steel rollers 8-in. diameter.

The boiler is mounted on an extension platform carried on two 15-in. by 4-in. channels securely bolted to the engine frame coal bankers and tank being carried on the same platform.

The engine has two 9½ by 12-in. stroke cylinders one mounted on each side of the main frame and directly coupled to the engine main shaft. The boiler is a 4-ft. 6-in. diameter by 6-ft. 3-in. high Spencer Hopwood quick steaming boiler 100-lbs. working pressure with both injector and duplex pump feed and all necessary fittings.

The driver's platform is immediately in front of the boiler and protected by a roof, the operating levers are directly in front of the driver and consist of steam, derrick and travel, slewing, hoisting, and reversing levers and also a foot brake.

A chequer plate platform on either side permits the driver or fireman to attend to any part of the machinery whilst crane is working.

The machinery is all mounted on a steel plate underframe carrying on the underside the propping joists and the whole carried on five pairs of wheels 43-in. diameter the journals being 6-in. by 12-in. all running in cast steel boxes.

The two leading pairs of wheels with a 5-ft. 9-in. wheels base run in a heavy plate frame bogie, the axle boxes of the remaining three pairs being mounted in the main frame with a rigid wheel base.

Heavy elliptical springs transmit the load from the frame to the axle boxes, a steel distance block placing the load directly on the spring buckle when the crane is working.

Both the crane and the match truck are equipped with Westinghouse air brakes as well as hand brakes. Janney Penn couplers with centralizing buffers permit of easy coupling on curves.

The match truck consists of a 15-ft. 4-in, channel under-frame mounted on two bogies with 2-ft. 9-in, wheels in diameter such bogies carrying a jib support on which the jib is lowered when traveling and a tool box.

With the crane standing on curve of about 312-ft. radius drawbars extended and jacked with screws at 15-ft. centres, rail clips not in use, pads all in place over spring buckles. Under this condition, the crane was tested with the result thus:

Load.	Radius of	Jib. Test.	Speed.
45 tons	20'-0"	Slewing clockwise an	
;,	22	Hoisting	14-ft. in 53 sec.
		r sq. in. Stop valve	
36 tons		Slewing clockwise	
55	,,,	" counter clockwis	se ", ", 57 ",
	85-65-lbs.	per sq. in. Stop valv	re 50-lbs. per sq. in.)
		Hoisting	
(B.P	90-80-lbs.	per sq. in. Stop valv	re 75-lbs. per sq. in.)
26 tons	24'-0"	Slewing clockwise an	d
		counter clockwise	
		er sq. in. Stop valve	
		Hoisting	
	집 [[[[[[] [[] [] [] [] [] [] [] [] [] []	r sq. in. Stop valve	
20 tons		Slewing clockwise	
,,		,, counterclockwis	
>>			
22		,, (fast ,,)	
		er sq. in. Stop valve	
15 tons	32'-0"	Hoisting	12'-6" in 18.5 sec.

Under all hoisting tests the crane jib was at right angles to the axis of the track.

To test the derricking speed, from max. radius—32-ft. to min. radius—20-ft. timing 46 sec. with no load on the crane.

Crane tested free on rails, screw jacks released free of packings, with a load of 7 tons, 0 cwt. and 2 grs. lifted at 20-ft. radius and gradually derricked out to 35 feet without tipping the crane.

The indicator plate showing the radius of the jib is marked with safe loads as follows:

35 1	tons	s at 20'-0" P	10 tons unpropped.				
26	"	,, 24'-0"	,,	7	23	,,,	
20	,,	,, 29'-0"	,,,	4	22	22	
15	19	,, 32'-0"	99	3		2.5	

The crane traveled freely on a curve about 312-ft. radius at 22-ft. 6-in. in 12 sec.

The bogie centre traversed 2-in. of the $3\frac{1}{2}$ -in. side play provided, the full weight is taken on the centre, the side bearers being quite clear.

The bogie control springs are put into place under slight compression, and under the actual test gave an actual compression on the control spring equal to a load of 80 cwts.

The crane was weighed, when lying quite level with

Gauge glas	ses on	boiler	 5-in. of cold water.
Tank			 Full.
Bunker			 ,, of coke.
Tools			 All on board, and

Crane jib supported as on match trucks.

The springs took the full weight of the crane and resulted as follows:

		L. H.	R. H.	T. C. Q.
1st fixed axle	 	9-13-0	10- 9-0	20- 2-0
2nd ,, ,,	 	9-18-0	10-7-0	20- 5-0
3rd ,, ,,	 	9-18-0	10- 3-0	20-1-0
Bogie	 	6-10-0	7-9-2	13-19-2
		7-18-3	8-19-0	16-17-3

T. 43-17-3 T. 47- 7-2 T. 91- 4-5

The crane was also tried with the match truck through the running gauge and was clear.

All machine cut gears bear the full length of teeth running very quietly.

Boilers, slewing pinion and rack were perfect and the slewing friction clutches worked without heating and all bearings were quite cool.

The boiler, boiler fittings, pump, injector and all other fittings and attachments were all satisfactory and in proper order.

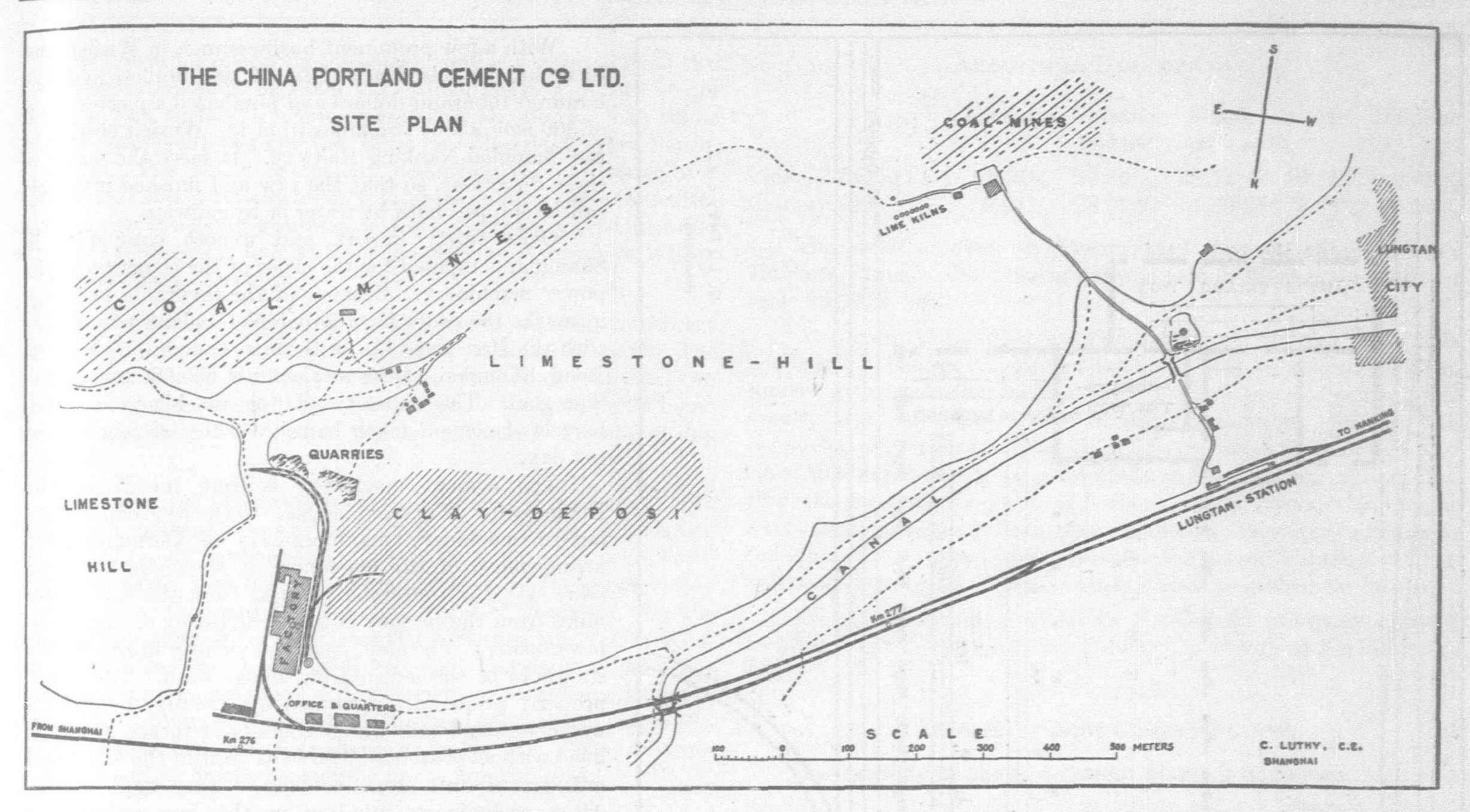
A Belgian Mission to China

A BIG effort is being made by Belgian manufacturers, aided by the government, to extend their foreign trade. Under the auspices of the comité central industriel, a Belgian organization similar to the federation of British industries, a mission, comprising representatives of the leading firms of the country, has started for the Far East with the avowed object of recapturing prewar markets for Belgian goods in China and Japan, which have been practically lost since the war.

A similar mission was organized by the government about a year ago under the direction of M. Rouma which, during the course of 1922, visited the various South American republics and carried out a program of trade propaganda for Belgian industry. Its effects are becoming apparent. Some months ago Brazil placed considerable orders with Belgian metallurgical firms, and now the Argentine republic has placed an order with the Comptoir des Aciéries belges for 30,000 tons of rails (37 k.g.), as well as for railway accessories. A further order for 54,000 tons of rails is announced, and negotiations have been opened in connection with the supply of 25 locomotives and 2,000 waggons.

The Polish government has just placed an order for 180 loco-motives and for railway materials, comprising signals, points, bolts, etc. The total value of foreign orders amounts to hundreds of millions of francs and will have the twofold effect of providing employment and improving the value of the Belgian franc.

The economic mission to China and Japan left Marseilles for Kobe on February 25. The mission is under the leadership of the well-known Mons manufacturer, M. Cannon Legrand, who will be accompanied by several technical experts, representing the following:—The Société John Cockerill, the Société Anonyme Ougrée-Marihaye, the Société La Brugeoise et Nicaise et Delcuve, the Maison Peltzer, of Verviers, the Forge de la Providence, the Société Anonyme d'Espérance Longdoz, the Nouvelles Usines Bollinekx, the Cableries du Hainaut, the rolling material manufacturers, the machine tool makers, etc. The mission also includes a delegate of the Banque Belge pour l'Etranger.



Cement Industry in the Orient

(Continued from March Number.)

By M. H. Chou, M.S., University of Wisconsin

The Shanghai Portland Cement Company

This company was organized by the well-known Shanghai merchant, Mr. Liu Hong-son, quite a number of years ago. Mr. Pao Li-liu, the general manager of the company, traveled extensively throughout America and Europe and finally placed the order for the machinery with the Perruseus Engineering Works of Germany, at a cost of over one half million dollars. The total capacity of the plant is 1,200 barrels per day. The works are situated one mile from Lunghua covering an area of about one hundred mow, facing the Soochow Creek on one side and the Whangpoo River on the other.

The plan for main mill and power plant was designed by E. J. Muller, consulting civil engineer, of Shanghai. The payment of the machinery was handled through the China Siemens Company. Construction work was started last spring and it is expected that it will be completed in the spring of 1923, and in operation by next autumn. The buildings of the plant are as follows: Main mill, power plant, godown, office building, engineer's residence, houses for working men, Chinese staff's office, machine shops, barrel-making factory. The raw materials—limestone—come from Wuchow, about 200 miles away; the coal from the Kailan Mining Administration. The erection work is being carried out by four German engineers under Mr. Molatore as chief engineer.

The China Portland Cement Co., Ltd.

(FACTORY AT LUNG TAN (NEAR NANKING))

This company was founded in the spring of 1921. The promoter is Mr. Yao Sing-kee, now managing director. Several sites were considered but the present location at Lung Tan with an abundance of raw material in the immediate neighborhood was selected as the ideal one. The limestone is of very pure quality. These rocks are covered with thick layers of clay. Chemical tests showed that the combination of these two materials in a certain proportion produce a portland cement of best quality. Some hundred yards away are coal mines which supply very cheap coal for the power station but as it contains too much sulphur and ashes cannot be used in the kilns

for manufacturing cement. The transportation of the raw materials is very economical, the deposits being higher than the factory and conveyed by gravity.

The factory is connected with the main line of the Shanghai-Nanking Railway by a two kilometre long siding with a reinforced concrete bridge over the navigable canal which connects the factory with the Yangtze Kiang, thereby having very favorable transportation facilities.

The order for the cement-making machinery was placed with Messrs. Nagel & Kaemp of Hamburg who submitted not only the lowest tender but also gave a guarantee for an up-to-date installation having motor drive throughout. The factory buildings were designed by C. Luthy, consulting engineer; the erection and supervision of the buildings were awarded to Mr. Yao Sing-kee.

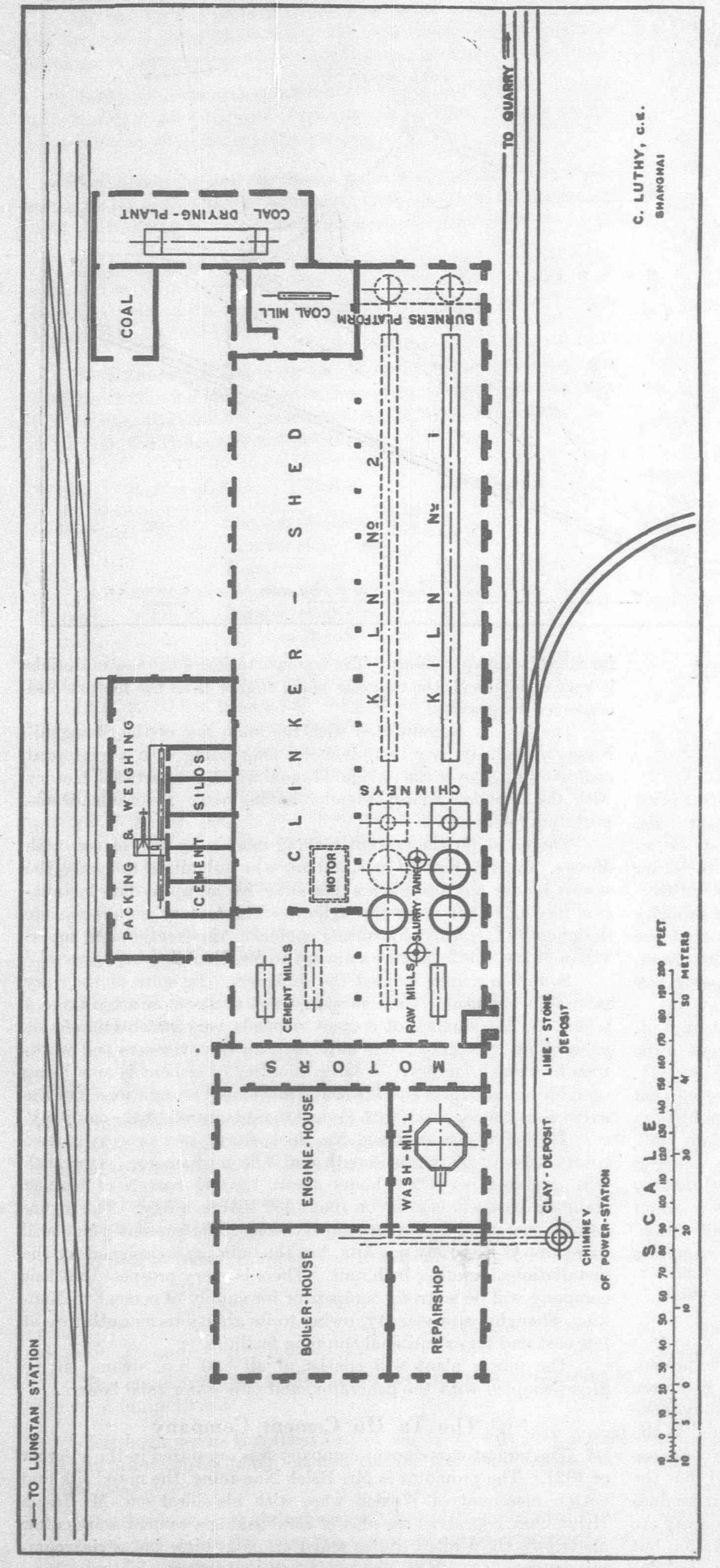
Sound principles guided the designers. In spite of the very favorable conditions they proposed not to start on a too large a scale. As the quality of cement depends very much on reliable supervision it is more economical to train the overseers and workman in a small factory. A large quantity of cement is now being used for the buildings and the heavy machinery foundations, but the extensions may be made with cement manufactured by the company.

The factory is designed for thick slurry wet process of two rotary kilns of 50 metres length and 2,25 m diameter. One such kiln produces per 6,000 hours about 120,000 barrels of highest standard portland cement or about 480 barrels a day. This figure can be increased by expert supervision. The present plant will be equipped with only one kiln, but the building is designed for the installation of another such unit. There is every prospect that this company will be a strong competitor for supply of cement in Nanking, Shanghai and vicinity, owing to its ability to manufacture at low cost and its exceptional shipping facilities.

The power plant will consist of an 800 h.p. steam engine direct-coupled with the generator, and two water-tube boilers.

The Ta Hu Cement Company

The largest new cement company was organized in the summer of 1921. The promotor is Mr. Hsieh Nan-ming, the noted silk and cotton merchant of Wusieh who, with his eldest son, Mr. Hsieh Hsiuh-chin, conceived the idea of establishing a cement works after his trip to the United States and Europe as high industrial commissioner.



Plan of the China Portland Cement Works

With a few prominent business men in Wusieh and Shanghai he raised a capital of one million and five hundred thousand dollars and purchased a piece of land of 300 mow about two miles from the Wusieh station of the Shanghai-Nanking Railway. It faces the water in three directions, so that the raw and finished materials can be shipped both by water or by railway.

Over thirty import and export companies in Shanghai competed for the order of the cement and the power machinery. Because of the favorable exchange in marks the order for the complete plant was placed with the Han Yuen Co., a German concern, 50 Kiangse Road, Shanghai, at the total sum of 650,000 taels C.I.F. Shanghai. The capacity of the machinery is 2,000 barrels of cement (each barrel, 375-lbs. of cement net) per day.

The cement machinery is from the Humbeldts Engineering Works, Cologne, Germany, one of the largest machinery manufacturers of Germany. The arrangement of the machinery is shown in the figure (No.). The limestone shipped from the hills a few miles from the factory is to be carried by coolies to the jaw crusher. The clay, from the vicinity of the factory site, is to be washed in a big sludge tank. The slurry, properly prepared, is pumped by a sludge pump to a wet compound mill which consists of rotary steel kiln lined with silex stone. The balls used in the compound mill are of flint stone pebbles of very hard quality. After preliminary grinding in the jaw crusher the limestone is elevated to a wet compound mill by an inclined bucket elevator, and further ground in wet to very finely divided paste. Then both the limestone and the clay slurry are pumped by means of an air compressor into mixing silos and properly mixed according to the proportion of their respective chemical constitutents. Samples for chemical analysis are to be taken and analyzed. After the mixed slurry is properly adjusted in its chemical composition, it is again pumped to a sludge tank where it is fed in to the rotary kiln by gravity. The amount of the slurry fed in can be adjusted by the arrangement provided in the tank.

The rotary kiln consists of steel drum lined with fire bricks which must be able to stand the temperature of 1,750°C. It is 220-ft. long. On the other end of the kiln coal dust with compressed air is fed in to burn the clinker. The waste gases pass along the kiln and dry the slurry and then pass through the chimney which is 190-ft. high. Near the chimney there is provided the dust chamber to collect the cement dust carried by the waste gases.

The burned clinker is carried by a conveyor through the steel cooling drum. Then it is elevated up by a bucket elevator and dumped into the clinker hall which is made of reinforced concrete. After being stored there for a month, the clinker is carried by a car and a certain amount of gypsum added. Both are elevated into a storage bin where they are fed into the compound mill. After being ground to 200 mesh, the cement silo consists of eight tanks each of which has the capacity of storing 400 tons of cement. Then samples of the finished cement are taken and tested for their physical properties. After fulfilling all the specified requirements of a sound cement, it will be packed by the pneumatic arrangement into jute bags or barrels or steel drums.

The powdered coal is prepared in the coal drying and milling department. It is first dried in a rotary kiln and then powdered to 100 mesh. The coal powder is elevated to a storage bin where it is fed in to the rotary kiln together with pre-heated compressed air.

The power for operating the cement mill is generated from two turbo-generators each of 1,000 k.w. which consists of two steam turbines, two surface condensers and two air filters. The whole turbine equipment is from the Bergman Electric Works, Berlin, Germany. The boiler equipment consisting of four water-tube boilers, four steam superheaters, four grate stokers, one economiser of 374 sq. metres heating surface, and other necessary pipe lines and other accessories was bought from the German Babcock & Wilcox Co., Oberhausen, Germany.

The barrels are made by special barrel making machinery which has the capacity of turning out 1,000 casks per 10 hours. The grinding machinery such as jaw crusher, compound mill, etc., can turn out sufficient quantities of raw materials for burning 24 hours in 10 hours time. The burning will be continuous throughout day and night.

Designing and Construction.—The designing of the cement mill, water tank, power house was done by Mr. E. J. Muller, of a Danish engineer of repute in Shanghai. The construction work was awarded to Mr. Chao Mow-kee, and is supervised by the construction engineer of the Company Mr. T. S. Sih, a M. I. T. graduate, who was construction engineer for the Great China Cotton Mfg. Co. in Woosung, before he joined the Ta Hu Cement Company. The other buildings such as main office, godown, engineer's residence, hospital, watchman station, staff residence, chemical laboratory, and working men house, etc. will all be designed by Mr. Sih. The construction work will be finished sometime in the June of 1923.

Erection.—At the time this article is written, the whole boiler equipment and over half of the cement machinery have already arrived at the factory site. The electric parts will be probably erected by the Chinese National Engineering Co., 6A Hongkong Road, Shanghai. The cement machinery will be put up by an engineer sent by the Humboldt Enginereing Works. A German cement expert of over ten years experience will probably be engaged to take care of the production. The chemist engaged by the company to do analysis work is Mr. C. H. Zee, instructor in chemistry in the Soochow University.

As regards the raw materials, the company has leased quite a number of limestone hills in Wusieh. Their chemical composition is as follows:—

ANALYTICAL DATA OF LIMESTONE IN WUSIEH.

			SiO ₂		CaO		Ignition loss
Sample	1	 	2.95%	1.18%	52.30%	.51%	42.43%
32			4.08%		50.47%		41.31%
22	3		4.71%	1.07%	49.57%	2.41%	40.94%
23	4	 	1.84%	.71%	52.05%	1.43%	42.44%

In Wusieh there is an inexhaustible white clay which is excellent material for cement making. Its composition has been analyzed as follows:—

ANALYTICAL DATA OF CLAYSTONE IN WUSIEH.

		SiO ₂	Fe ₂ O ₃ Al ₂ O ₃	CaO	MgO	Ignition loss
Sample	1	 62.92%	27.51%	trace	.69%	5.28%
53	2	 65.43%	25.93%	.80%	.55%	4.70%
"	3	 68.41%	65% 22.12%	.12%	.31%	5.04%

With good raw materials available in Wusieh we are again particularly favored to turn out cement at very low production cost.

As regards coal, we have also analyzed many kinds produced in China.

ANALYTICAL DATA OF COAL.

	Moisture	Volatile matter	Fixed	Ash	Sulphur
Chiang Waung Chung Shing	2.76% 9.97%		48.94%		

The small amount of gypsum used may be obtained from Hankow, China. The price of gypsum sold in Wusieh is about two taels for 133\frac{3}{1}\cdot 1bs.

At present the market price of cement varies from 4-4.5 taels per barrel. The Ta Hu Cement Company may be able to turn out cement at considerable lower price. The low price of cement will greatly stimulate the amount of its consumption. Further the people have been gradually awakened to the importance of highway construction in order to promote trade and commerce. A step further, the necessity for repairing harbors, canals, rivers, which are in a very deplorable condition to-day will demand the supply of Chinese cement many hundred fold. Next to the cotton industry cement will promise to be one of the greatest industries in the near future.

From cement industry the Ta Hu Cement Company expects to branch out in cement brick industry, pottery and tile industry, etc.

CAPACITY OF NEW CEMENT PLANTS.

The capacity of the new cement plants is as follows:

]	Barrels		
The	China Port	tland (Cement	Co.				500	per	day
,,,	Shanghai	,,	,,,	22				1,200	"	22
2,2	Ta Hu	22	"	,,,		•••		2,000	93	22
					To	tal		3,700		

The total capacity of three factories will be 1,058,500 barrels annually.

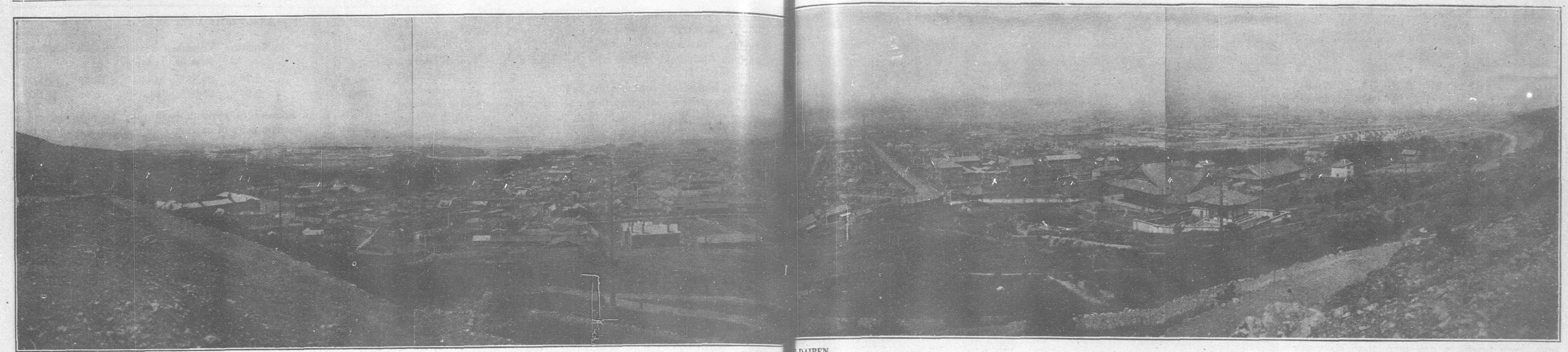
Electrical Enterprise in China

A MID the political turmoil and resulting trade depression in China, it is pleasant news to hear that, after mature consideration, another well-known firm of British electrical manufacturers is opening a branch in Shanghai.

During the past twelve months Mr. A. R. Kibblewhite, of the old established firm of Callender's Cable & Construction Co., Ltd., has been making a very careful investigation, on the spot, of the future possibilities of the electrical industry in this country. As the result of his carefully weighed recommendations, the firm is opening its own office at 26 Peking Road, Shanghai, and has appointed as manager Mr. A. H. Gordon, A.M.I.E.E., recently manager and chief engineer of the British Electrical and Engineering Company of China, Ltd.

Callender's were the pioneer manufacturers of vulcanised bitumen cable for the transmission of electrical power and, since the seventies, have kept pace with the rapid progress made by the electrical industry. The Company has very extensive works on the south bank of the Thames at Erith, Kent, where heavy cable, electrical accessories and Kalanite insulating material are manufactured, while all rubber wire and cable are manufactured at their Anchor Works, at Liegh, Lanchashire. The head office of the firm is at Hamilton House, Victoria Embankment, London, E.C. 4.

The issued capital of the Company totals £1,300,000 and the average dividend on the ordinary capital for the past eighteen years has been fifteen per cent. per annum.



PANORAMIC V

The Foreign Trade of Manchuria

HE American traveler in Manchuria to-day, who But it was half a century later before Dairen, Antung and the rides in comfort in a Pullman sleeping car behind a other ports of Manchuria were opened to the trade of the world. Baldwin locomotive, over 100-pound Pittsburgh rails; from the modern port of Dairen, with its beautiful plaza, and its great modern banks, business houses and public buildings; and then northward through cities lighted by electricity, with modern railway stations, paved streets, modern hotels, schools, hospitals and scientific laboratories; past American-equipped steel works, coal mines and factory buildingswith such a magic transformation before his eyes the traveler finds it difficult to believe that only a few years ago this country was the home of the Manchu rulers of China and a forbidden land to world commerce.

Trade was a business of the lowest caste of Chinese, and particularly in Manchuria, as the Manchu dynasty forbade the desecration of this sacred ground even by the Southern Chinese. Manchuria for the first time was connected with Shanghai, the economic centre of China, when the port of Newchwang (now Yingkou) was opened to trade by the Tientsin treaty (1858) between England and China.

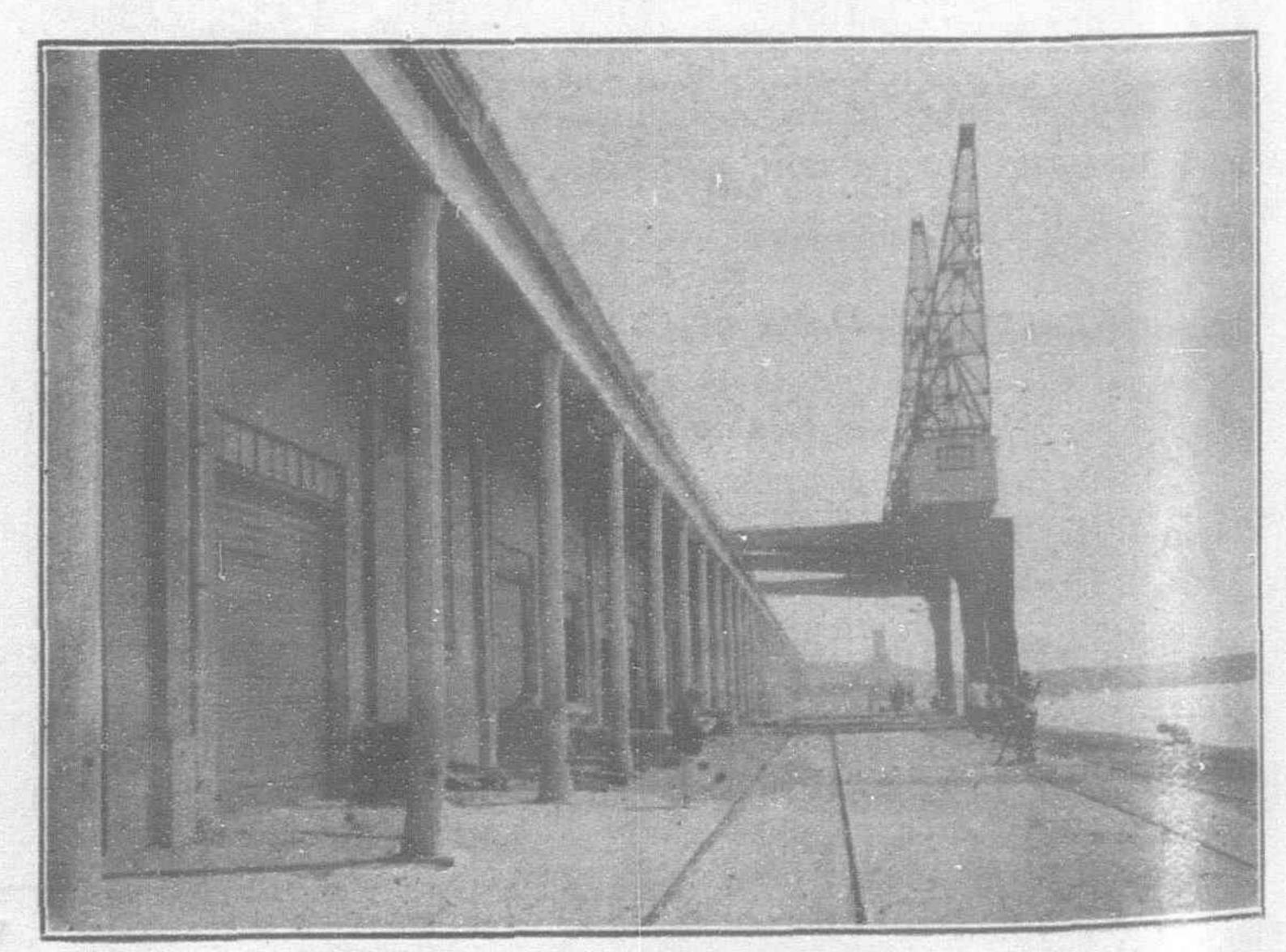


Wharf Office, Dairen

A very slow development of Manchurian trade followed the opening of the port of Newchwang. It was not until 1900 that the Russians began the construction of the Chinese Eastern Railway, which was to give them, in connection with their Trans-Siberian line, an outlet on the Yellow Sea at Port Arthur. But the real awakening of Manchuria came with the Russo-Japanese war of 1904, and the taking over of the southern portion of the railway line by the Japanese in 1907 under the terms of the treaty of Portsmouth. Since then Manchurian commerce has grown tremend-

The gateways of Manchurian trade are Dairen, Yingkou, Antung and Vladivostok. Of these four the port of Dairen has made the most conspicuous progress. It has now outstripped Tientsin, and leads all other Chinese ports, except Shanghai.

Growth of the Port of Dairen .- The growth of Dairen as a shipping port is indicated in the number and tonnage of vessels arriving at the Dairen wharves in 1908 and 1920, being 1,357 vessels with



Concrete Wharves and Warehouses, Dairen

of 4,864,904 in 1920.

Before the European war the American flag was rarely seen in the port of Dairen, but since the war there has been a very large increase in American tonnage. The following table shows the tonnage of vessels of he principal maritime nations arriving at Dairen every third year since 1908:

Shipping Tonnage Arriving at Dairen: By Countries

	Japanese	Chinese	British	American	Others
1908	 1,407,778	31,041	310,756		80,346
1911	 1,872,294	55,818	398,141		336,690
1914	 3,034,075	98,476	433,909	3,302	268,316
1917	 2,628,570	176,853	183,596	3,198	121,498
1920	 3,408,369	483,073	421,028	381,729	170,705

The other leading nations represented in the 1920 arrivals were: Russian, 34,146 tons; French, 18,277 tons; Norwegian, 11,618 tons. Before the war the German tonnage ranked next to the Japanese and British, reaching 307,000 tons in 1913.

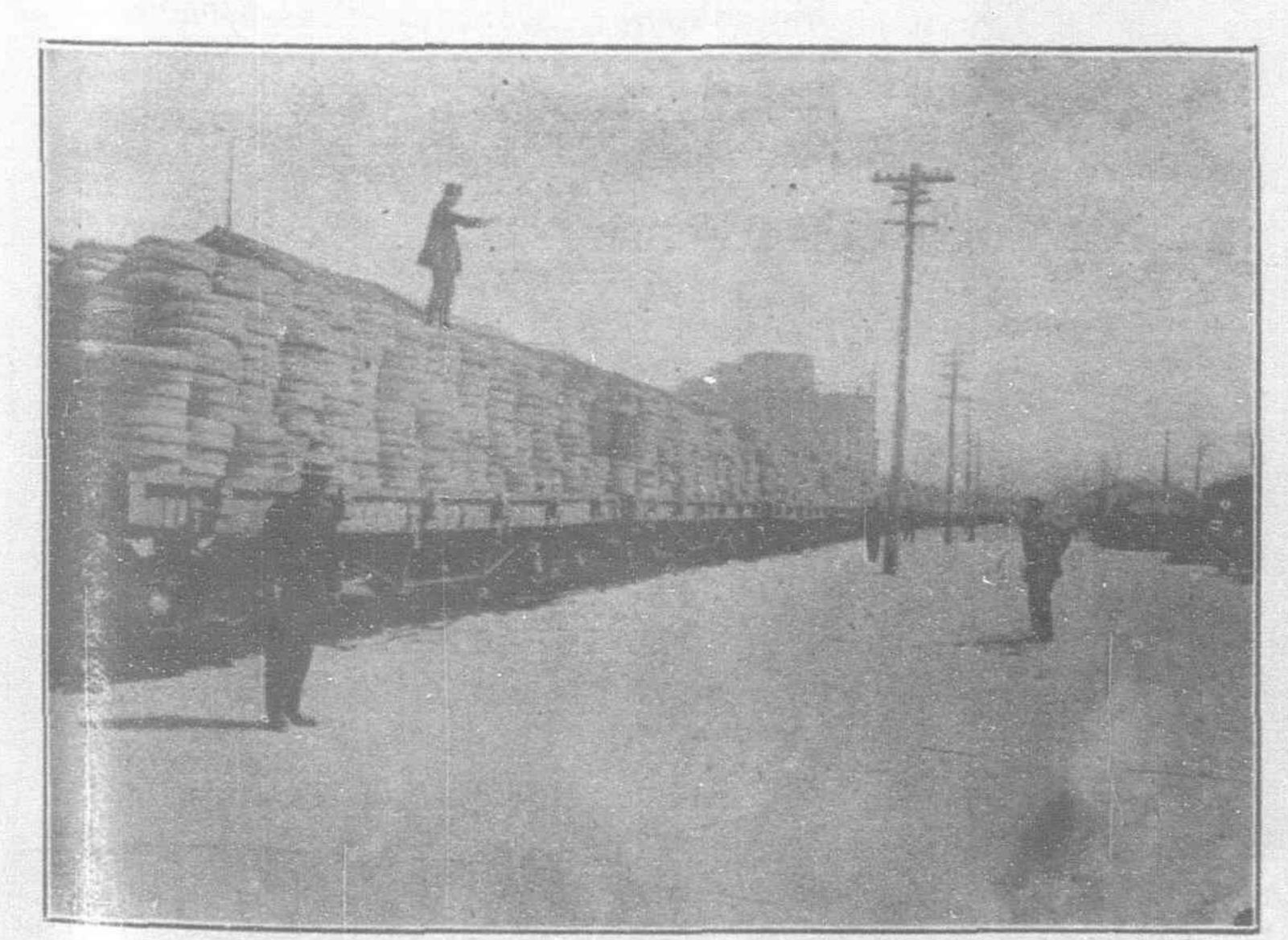
A large part of the imports unloaded at the Dairen wharves naturally comes from the neighboring countries of the Far East, but, since the South Manchuria Railway began making heavy

a tonnage of 1,829,921 in 1908, and 2,942 vessels with a tonnage purchases in the United States, there has been a very considerable overseas trade. The tonnage of imports from the different countries for 1908 and for the period 1914-1920 is shown herewith:

Tonnage of Imports into Dairen: By Countries

					U.S., Europe	Total Tons
		Japan	China	Chosen	and Others	Imported
1908		214,551	14,442	15,584	92,350	. 336,927
1914		258,865	121,367	17,009	108,533	505,774
1915		240,685	164,062	20,948	111,535	537,230
1916		313,131	194,316	26,689	65,786	599,922
1917		424,065	278,130	35,893	95,180	833,268
1918		466,144	392,952	27,930	69,519	956,545
1919	•••	730,004	528,153	16,887	135,575	1,410,619
1920		588,519	274,730	22,938	88,028	974,215

The value of Dairen's foreign trade has greatly increased, the total exports and imports being now about seven times as large as in 1908. The record of the maritime customs trade of Dairen, in Haikwan taels, in 1908 and 1920, is shown in the three tables following :-



Hills of Bean Cake on a Freight Train entering the Dairen Wharf Compound for Ocean Shipment



Magnificent new Building of the Dairen Paper, Produce and Stock Exchange

Value of Imports at the Port of Dairen

	From	From	
	Foreign	Chinese	Total
	Ports	Ports	Imports
	(taels)*	(taels)*	(taels)*
1908	 17,215,936	3,060,713	20,276,649
1920	71.040.883	22.028.602	93.069.48

Value of Exports at the Port of Dairen

	To	To	
	Chinese	Foreign	Total
	Ports	Ports	Exports
	(taels)*	(taels)*	(taels)*
1908	 5,069,133	7,342,402	12,411,535
1920	 16,842,406	108,223,857	125,066,263

Exports and Imports: Port of Dairen

	Imports	Exports	Total
	(taels)*	(taels)*	(taels)*
1908	 20,276,649	12,411,536	32,688,184
1920	93,069,485	125,066,263	218,135,748

Dairen's exports trade is largely made up of agricultural products and coal. In tonnage, soya bean products are more than sixty per cent. of the exports. The growth of the export trade in the principal items since 1908 is shown in the following table:—

shown in the	follo	owing tabl	e :			
(omm	odities Ex	ported from	m Dairen (in Tons)	
		1908	1911	1914	1917	1920
Beans		182,629	272,457	255,112	191,780	567,129
Bean cake		204,627	446,801	512,823	852,867	1,131,208
Cereals		13,781	97,004	118,259	198,684	707,237
Coal		7,703	91,115	559,761	494,645	212,589
Sundries		28,646	39,285	98,518	258,332	278,935
Total		437,386	946,662	1,544,473	1,996,308	2,897,098
Bunker coal		15,276	55,322	247,193	206,131	195,428



Just Beans and Bean Cake: Nearly Two Million Tons of these Products pass annually through the Port of Dairen

Imports from Imports from Total

Foreign Trade of Manchuria.—With the development of the port of Dairen, the gateway to Manchuria, the foreign trade of the country has grown apace. Three years after the Russo-Japanese war, when Dairen and Antung were opened to commerce, the total trade reached \$40,000,000. In the first year after the close of the European war it had risen to nearly \$500,000,000. The foreign trade returns for the years, 1911 and 1920, are as follows:

Foreign Trade of Manchuria (in U.S. Dollars)

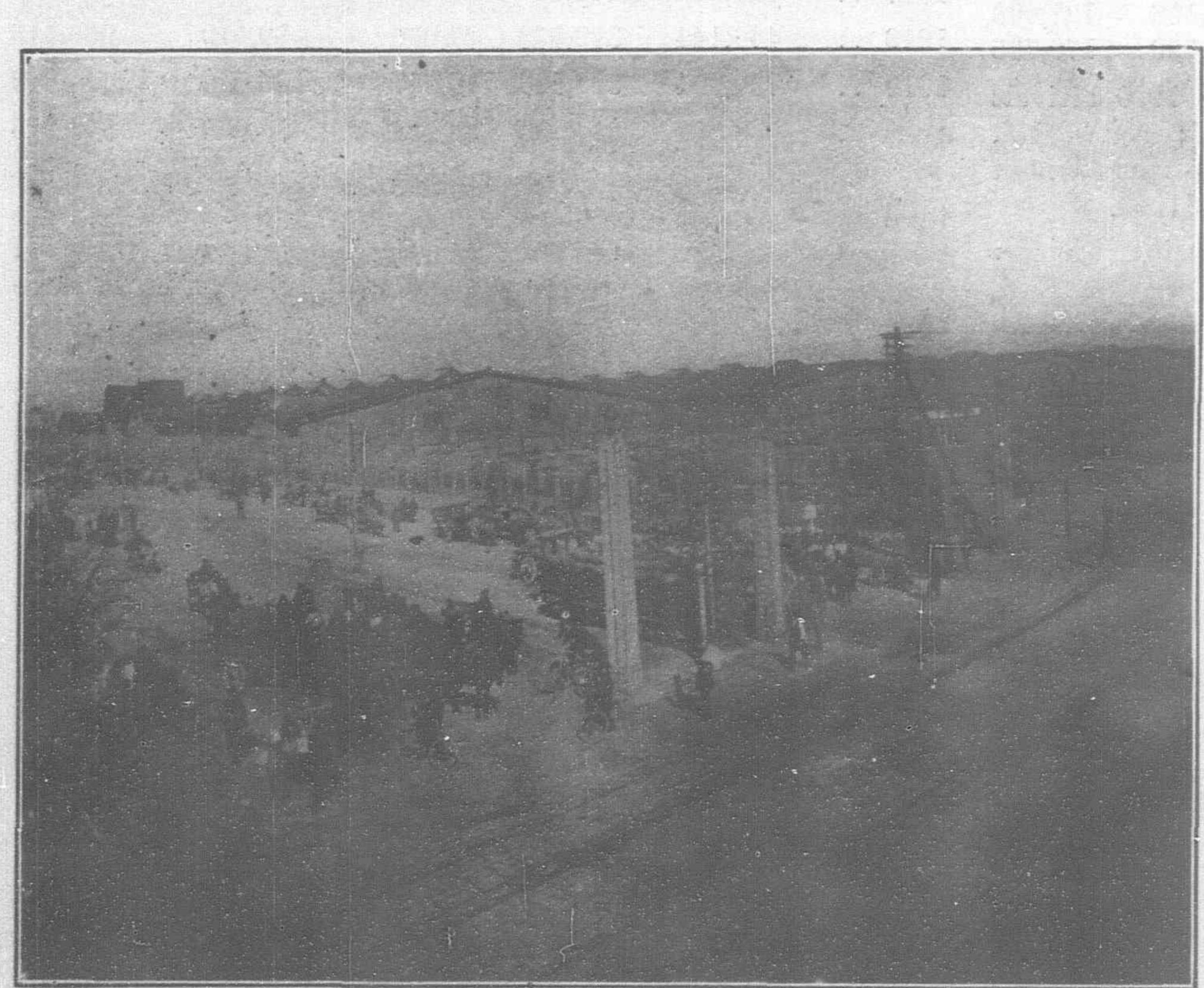
1320 . 100,000,000 00,000,000 001,010,000 001,011,001 223,201,210	1911 1920	•••	Foreign Ports \$ 44,534,998 156,990,557	Chinese Ports \$17,937,313 50,923,282	Imports \$ 63,472,311 207,913,839	Exports \$ 64,924,367 221,517,637	Total Trade \$128,396,678 429,431,476
---	--------------	-----	---	---	---	---	---

Principal Exports and Imports.—Manchuria exchanges her raw materials for the manufactures of other countries. She imports little raw material, and exports few manufactures. The country is still primarily agricultural, although manufacturing is rapidly developing. The soya bean is the foundation of her trade, comprising about half the value of all exports. The values of the principal exports in 1920 were as follows:

Bean cak	es		***		\$60,236,000
Beans					35,098,000
Bean oil	***	***			22,131,000
Wheat					28,214,000
Other cer	eals			***	19,651,000
Coal and	coke				8,688,000
Wild silk	yarn				7,680,000
Wild silk		***			2,627,000
Kaoliang		***			7,122,000
Lumber		***			3,935,000
Corn		***			2,672,000
Metals	•••		***		2,488,000

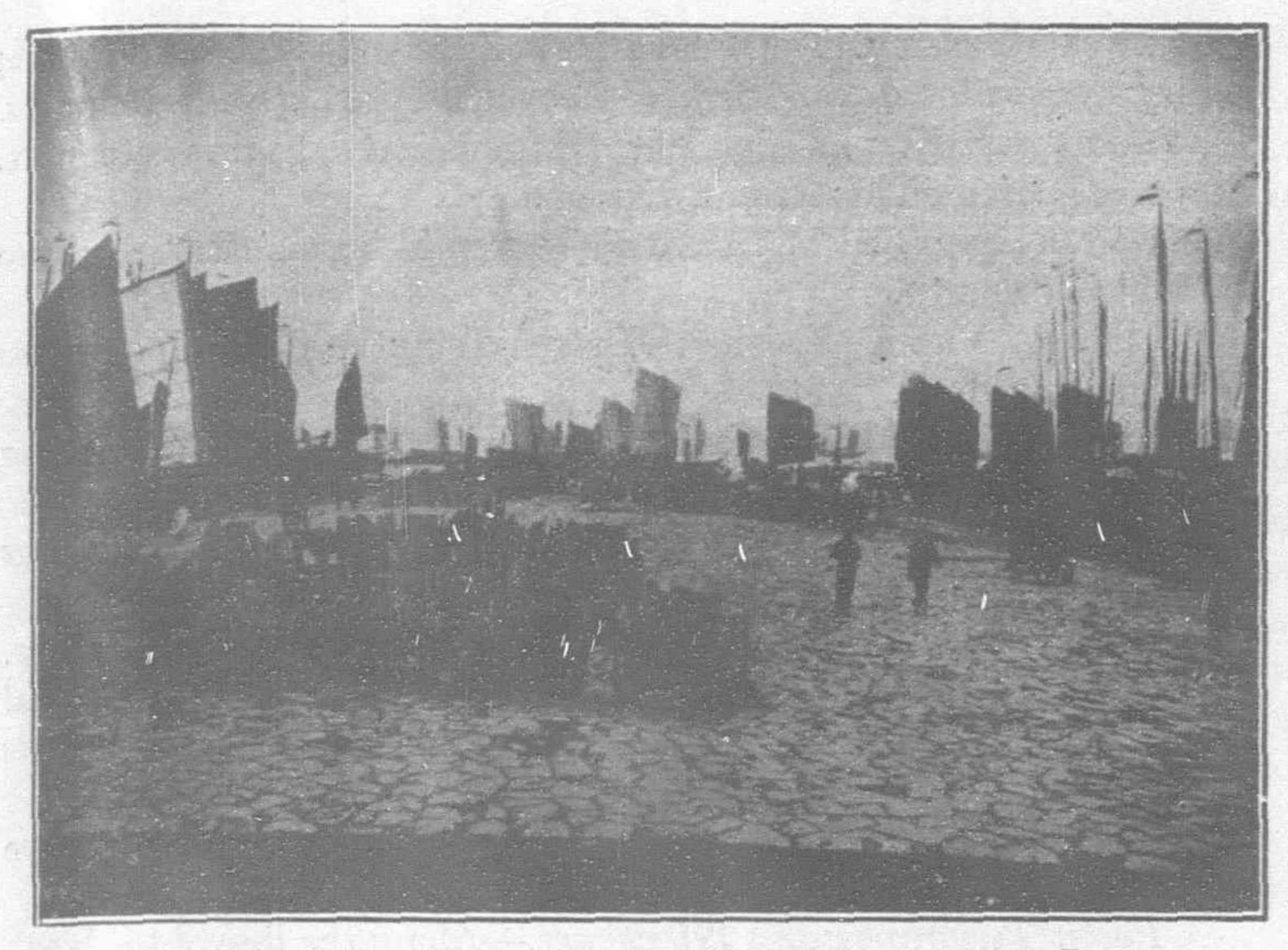
Values of some of the principal imports in 1920 were:

Cotton go	ods	***			\$62,099,000
Cotton ya			***		17,009,000
		***	***		14,477,000
Machinery	7	***		***	8,531,000
Tobacco	***	•••	***	***	9,090,000
Fabrics (o	ther t	han co	tton)		8,084,000
Bags	***	***	***	***	7,347,000
Kerosene	***	***	***	***	6,087,000



A Traffic Hold up at a Railway Crossing in Dairen: The Warehouses are filled with beans, the yards are piled high with bean cake under tarpaulins; the carts are transporting beans to the Mills, while the Tramways are employed to help out the enormous movement

*Chinese customs returns are reported in Haikwan silver taels. The exchange value of the tael varies with the price of silver. From 1908 to 1915 the average value of the tael in United States currency was 67 cents. In 1916 it was 79 cents; 1917, \$1.30; 1918, \$1.26; 1919, \$1.39; 1920, \$1.24.



Chinese Junks Aid the Railway to Transport Beans to Dairen



Even on the Banks of the Yalu at Antung the foreshore is covered with Piles of Beans and Bean Cake

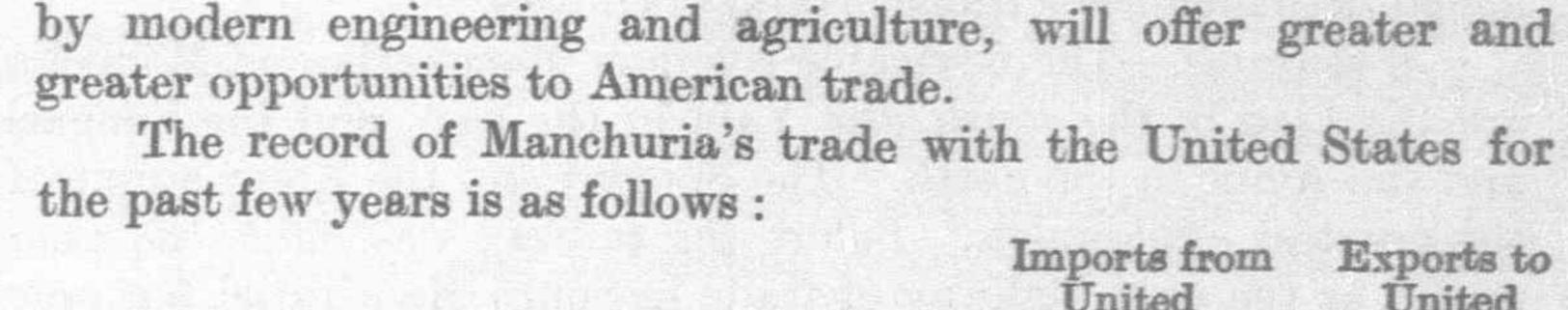
Trade with the United States.—A very considerable part of the overseas trade of this rapidly developing country is with the United States, because it is to America that the builders of Manchurian industries have turned for modern machinery and railway materials.

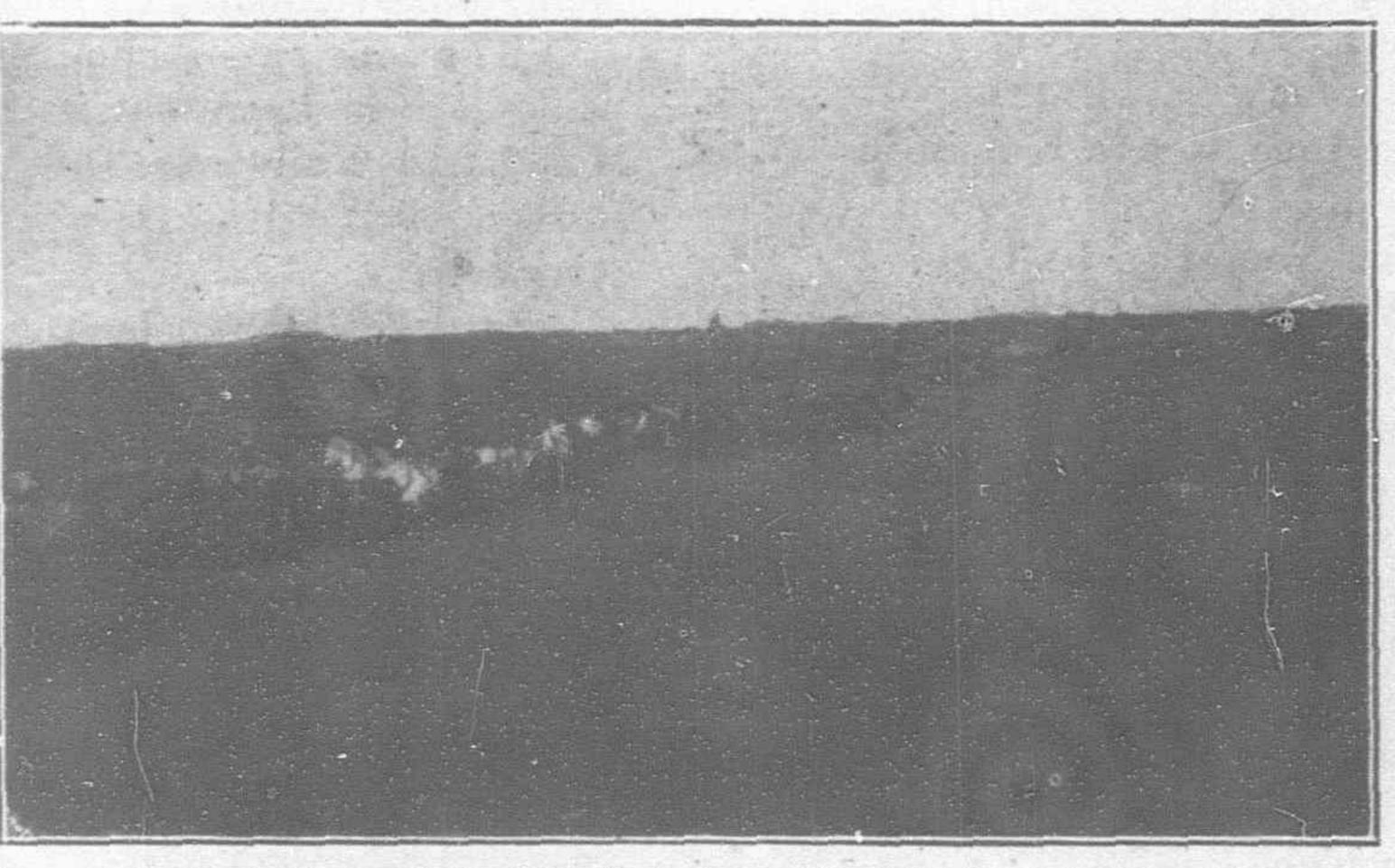
American manufacturers have found an open door in Manchuria for their products, and the return tide of Pacific traffic has brought to the United States an increasing flow of the products of the rich soil of Manchuria.

The South Manchuria Railway has purchased in the United States \$50,000,000 worth of locomotives, cars, rails and other materials, and the industries developed by it in the railway zone have imported \$25,000,000 worth of machinery and materials. In contrast to this open door for American products in

Manchuria The Far Eastern Review stated that railways in neighboring provinces of China had purchased \$67,500,000 of materials in Europe, but none in America.

Manchuria, as its latent resources continue to be developed Mukden-Antung Line, Suchiatun-Antung





A Typical View of the S.M.R. Station Yard at Changchun where Piles of Beans in Bags Stretch for Miles Awaiting Shipment

	Imports from United States	Exports to United States
1910	\$1,212,582	\$8,671
1911	1,300,169	20,400
1912	1,444,318	4,493
1913	1,689,215	88,629
1914	3,401,336	479,972
1915	1,784,305	280,492
1916	1,673,092	1,724,091
1917	6,293,941	16,399,301
1918	15,323,807	35,766,620
1919	27,678,116	14,474,853
1920	15,871,554	16,514,377

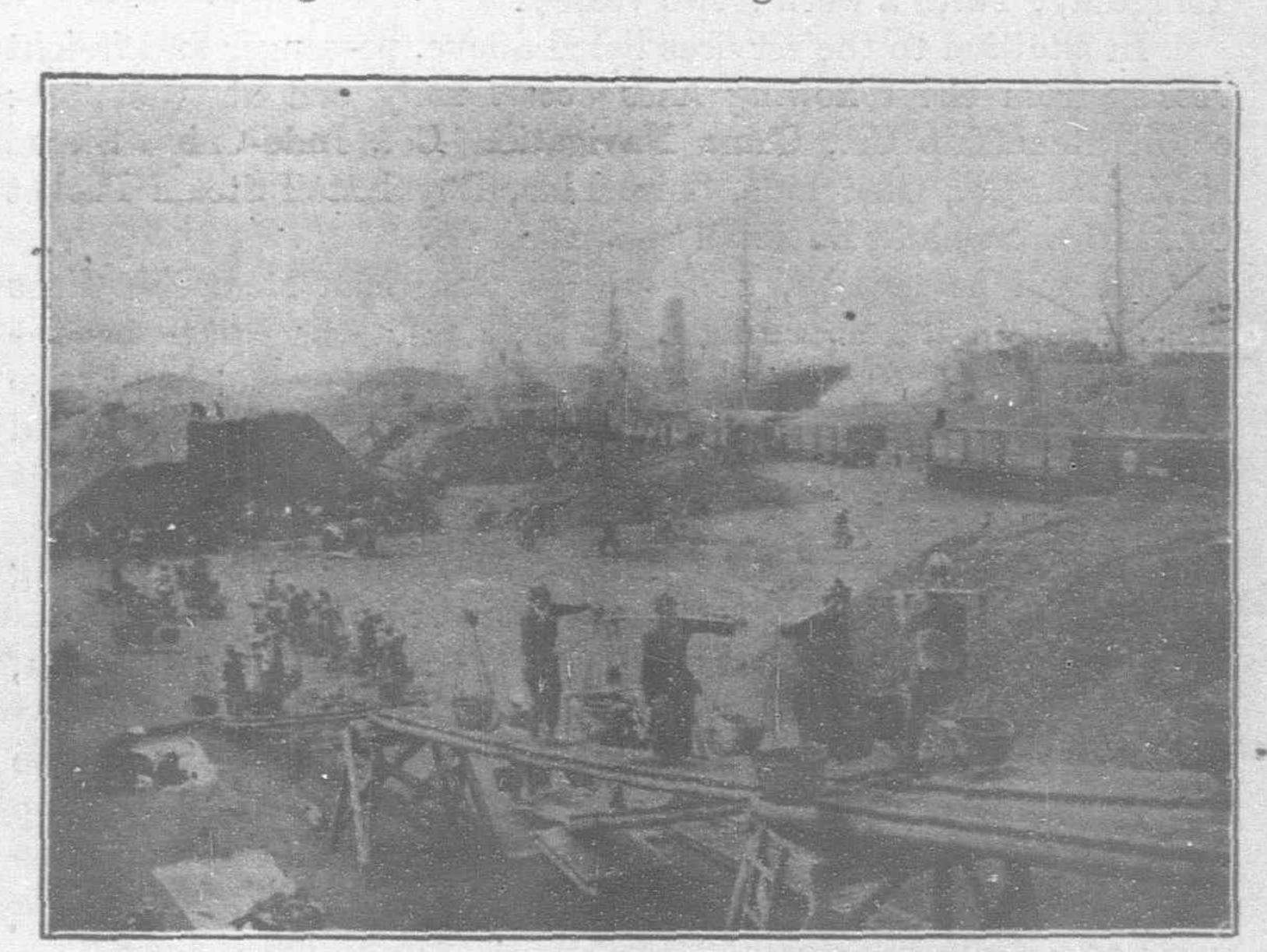
(2) Facilities for Commerce

Railways.—More than 2,200 miles of railway are now in operation in Manchuria. These lines are as follows:

South Manchuria Railway—686 Miles	Mileage
South Manchuria Railway, Main Line, Dairen-Cl	angchun. 439
Mukden-Antung Line Suchiatun-Antung	162



Another View of Activity on the Dairen Wharves



Loading Bunker Coal at Dairen Wharves

		Mile	eage
Ryojun (Port Arthur Branch, Chouchuitzu-Ryojun)		29
Fushun Branch, Hunho-Fushun			33
Yingkou Branch, Tashihchiao-Yingkou			14
Yentai Colliery Branch, Yentai-Yentai Colliery			9
Chinese Government Railways—522 Miles		Mil	eage
Kirin-Changchun Line, Changchun-Kirin			79
Ssupingkai-Taonan Line, Ssupingkai-Paiyintailai			125
Part of Peking-Mukden Line, Mukden-Shanhaikwar	1.		261
Yingkou Branch Line, Yingkou-Koupantzu			57
Railways Under Russo-Chinese Management—1	,078	3 Miles	
Chinese Eastern Railway—		Mile	eage
(Western Section) Manchouli-Harbin			584
(Eastern Section) Harbin-Pogranishnaya			341
(Southern Section) Harbin-Kwanchengtzu			148
Jalainor Colliery Branch Line			5

When the Kirin-Huining Railway, together with five proposed railways in South Manchuria and Inner Mongolia are completed and opened for operation, 1,500 additional miles of line will be

added to Manchuria's transportation facilities.

Waterways.—The navigable rivers in Manchuria and Mongolia are the Liao in the south, the Yalu in the east, and the Sungari and the Amur in the north. The Sungari and the Amur admit of the greatest exploitalon. Before the railway was built, the Liao served as the only highway of trade in South Manchuria, but now its old glory has vanished. Some 1,500 junks are in operation on the Liao and the river is still a trade channel of importance to interior Mongolia. The Yalu and Liao Rivers remain ice-bound from December to March, while the ice-bound period on the Sungari and the Amur extends from November to April.

Ocean Steamship Services.—With the rise of the port of Dairen to second place among all the ports on the China coast, and the development of the harbor facilities for berthing ocean steamships and handling freight, shipping offices of all the shipping companies with Pacific routes have been established at Dairen. The "Commercial Handbook of China," published by the bureau of foreign and domestic commerce, Washington, gives the following summary

of the steamship services at Dairen:

The steamship lines with ocean-going vessels calling regularly at Dairen are as follows:

Osaka Shosen Kaisha: Dairen-Kobe (via Moji); twice a week; four vessels. Dairen-Nagasaki (via Korean ports); monthly; one vessel. Tientsin-Takao, Formosa (via Dairen and Chinese ports); thrice a month; three vessels.

Nippon Yusen Kaisha: Yingkou-Yokohama (via Dairen, Tientsin, Chemulpo, Kobe); thrice a month; three vessels.

South Manchuria Railway Company: Dairen-Shanghai (via

Tsingtau); twice a week; two vessels.

In addition to the services listed above, passenger and freight vessels from the following lines occasionally call at the port: ocean Steamship Co., China Navigation Co., Indo-China Steam Navigation Co., Glen Line, Shire Line, Royal Mail Steam Packet Co., Indra Line and Bucknail Steamship Co.

As will be noticed, there are no American steamship lines represented in the above lists. It is therefore necessary for the American shipper to send his cargo to Yokohama or Kobe and have it transhipped there to one of the Japanese lines to be forwarded to Dairen, unless, of course, a full cargo can be made up and sent directly to Dairen by a tramp steamer.

Steamship Lines Now Operating to Dairen.—The following

steamship lines are now operating to Dairen:—
Toyo Kisen Kaisha: Dairen-San Francisco, via Yokohama,

Toyo Kisen Kaisha: Dairen-San Francisco, via Yokohama, Hongkong and Honolulu; two sailings per month. Osaka Shosen Kaisha: Dairen-Osaka, via Moji and Kobe; two

Osaka Shosen Kaisha: Dairen-Osaka, via Moji and Kobe; two sailings per week. Seattle, Tacoma via Kobe; three steamers; stop at Dairen on eastbound voyage. New York via Panama; three steamers; stop at Dairen on eastbound voyage. European line via Suez; two steamers; stop at Dairen on outward voyage.

Nippon Yusen Kaisha: Osaka-Newchwang via Kobe and Dairen; sailing every nine days. Service suspended during winter months.

Yokohama-North China Line (Dairen-Seattle); three steamers. Stops at Dairen on eastbound voyage.

Dairen Kisen Kaisha: Tientsin-Dairen-Tsingtao-Shanghai; two sailings per month.

Chosen Yusen Kaisha: Dairen-Tsingtao-Chemulpo; three sailings per month.

To-wa Kisen Kaisha: Dairen-Lungkow; three sailings per month.

Chingkee Steamship Company: Dairen-Chefoo; twelve sailings per month.

Awakyodo Kisen Kaisha: Dairen-Tsingtao. Dairen-Chemulpo.
Norton Lilly Company, 26 Beaver Street, N. Y. C.: General
agents for companies having steamers leaving Atlantic Coast Ports
for Dairen.

Barber Steamship Lines, 17 Battery Place, N. Y. C.: Have steamers leaving Atlantic Coast Ports for Dairen.

Posts, Telegraphs and Telephones.—Along the line of the South Manchuria Railway, postal, telegraph and telephone systems are organized and operated by the Japanese authorities. More than 700 miles of telegraph lines and 1,000 miles of telephone lines (the two services using more than 20,000 miles of wires) have been installed. Chinese post-offices are maintained in all towns outside Kwantung, in which territory the postal service is operated by the Kwantung Government. Communication facilities are constantly being improved and expanded.

Warehousing.—A number of warehousing and forwarding companies are in operation in the principal towns along the South Manchuria Railway. The railway maintains warehouses and storage yards at the Dairen wharves and at the principal railway

stations.

Insurance—Branches of the leading Japanese, English and American insurance companies are maintained at Dairen. At the end of 1919 there were 61 insurance offices in Kwangtung territory, 130 in the South Manchuria Railway zone, and 93 outside of the zone. The total amount of insurance in force was 666,800,000 yen. Freight at the Dairen wharves is insured by the railway company, by arrangement with a number of insurance companies, and this insurance is voluntarily effected by the South Manchuria Railway without charge to the owners of the goods.

Banking.—Manchuria has adequate, modern banking facilities, the great Japanese and foreign institutions maintaining branches in Dairen and other cities. In addition there are a number of local institutions. The Japanese banks maintain twenty-six main offices and sixty branch offices, while the Chinese banks have eleven main

offices and seventy branch offices.

The Bank of Chosen (\$25,000,000 paid-up capital) and the Yokohama Specie Bank (\$50,000,000 paid-up capital) are the largest institutions maintaining branches in Manchuria. They have built imposing banking houses in Dairen, which are among the most beautiful structures facing the plaza. The principal banks in Manchuria are as follows:

	Jap	anese		Authorized	1 Capital	
Bank of Chosen				 yen	80,000,000	
Yokohama Specie	Bank			 No.	00,000,000	
Chenlung Bank					20,000,000	
Dairen Bank				yen	3,000,000	
Liaotung Bank				 	3,000,000	
Lungkow Bank				-	11,000,000	
Dairen Commercial	Bank		• •	 -	2,275,000	
	Chi	nese				
Bank of China				 yuan (60,000,000	
Bank of Communic	ation			tael	15,000,000	*
Three-Eastern Prov					600,000	
Mukden Industrial	Bank				13,000,000	
Kirin Provincial Ba	ank				1,500,000	
Heilungkiang Provi						
Frontier Developm				silver yen		
				W. Control		

Currency.—As in other parts of China, there are many kinds of currency in circulation.

The foreign bank-notes exert a great influence, and it is mainly through them that the foreign trade of the country is actually carried on. These bank-notes circulate in large amount, and within the limits of the Leased Territory and the railway zone are practically the sole currency. It should be noted, however, that, outside these limited places, their circulation is greatly modified, because, though they are used very extensively and freely for all trading purposes, mutual transactions between the natives are carried on in native currency.

The "Economic History of Manchuria" gives the following table of moneys in circulation in Manchuria:—

(Cash (chuhchien), Copper coin (tungyuan), Silver doallar (yangchien), Coins Sycee (yinting). Chinese currency (Government notes (kuantieh), Copper coin notes (tungyuanpiao), Silver dol-Notes lar notes (yangchienpiao). Japanese silver yen, Mexican dollar, Jap-Coins anese and Russian subsidiary coins. Japanese military notes, Bank of Japan notes, Foreign currency Bank of Chosen notes, Notes Yokohama Specie Bank notes, Russian ruble notes.

Trade Organizations.—Chambers of commerce are maintained at Dairen, Mukden, Antung, Changchun, Yingkou and other cities. At every trade centre there is a Chinese guild. The Dairen organization publishes periodical reports on the trade and industry of Manchuria.

The Dairen Produce Exchange was established in 1913; in 1915, a produce and currency exchange was opened at Kaiyuan, and another at Changchun in 1916. In 1917, a currency exchange was established in the Dairen Produce Exchange, and now the produce and currency exchanges are known as the Dairen Exchange. In 1919, produce and currency exchanges were opened at Kungchuling, Ssupingkai and Tiehling, and in 1920, at Mukden, Yingkou and Liaoyang. In addition stock and merchandise exchanges have been founded at Dairen, Mukden and Antung under private management.

On these exchanges there is trading in beans, bean cake, kaoliang, bean oil, wheat, Italian millet, etc., gold notes issued by the Bank of Chosen, Russian ruble notes, silver notes issued by the Yokohama Specie Bank, Chinese small silver coins, and Chinese small silver coin notes. In Manchuria, owing to the great variety of currencies in circulation and more particularly because of the constant fluctutations in their exchange rates, the currencies have come to be looked upon as commodities. Because of this peculiar feature in the currency situation in South Manchuria, the exchanges are under government management; and in order to guarantee delivery and to settle accounts between sellers and buyers, a trust and guaranty company under private management is attached to each exchange.

For the purpose of providing long-term capital to develop the country, there have been organized the Oriental Developing Company, the Eastern Enterprise Company and the Manchurian Enterprise Company. These financial institutions make loans against lands and leads and leads and leads and leads are the institutions.

lands and buildings.

A commercial museum was established in Tiehling in 1906. Similar institutions were opened later in Changchung, Antung and Harbin. The Kwangtung government recently established in Port Arthur the Manchuria-Mongolia production museum.

THE YOKOHAMA SPECIE BANK NEW BUILDING

[Continued from page 246]

and on the south by the former German Club. The building is on the bend of the Whangpoo River and with the lawn and approaches in front obtains a first class outlook.

The design is of a severe, chaste, and broad character, Neo-Grec in style, relying on scale, proportion, and combination of materials for its individuality.

As in the case of the Hongkong & Shanghai Bank and Chartered Bank of India, Australia & China it is of steel framed construction throughout, fabricated by Messrs, Dorman & Long, with fire resisting reinforced floor and roof slabs. The structure is built upon a foundation consisting of a reinforced framed concrete raft superimposed on piling.

The Bank is to be a stone fronted building of Japanese granite with metal windows and facings, and its details are a departure from precedent. The ground floor entrance is a bold feature, and all the stone details are vigorous owing to its position and foreground, the heavy mass and simple detail carrying across these open spaces.

The principal consideration in the formation of the interior is to provide a large well lit banking hall with rooms and offices planned for the effective administration and to simplify the complex work of a bank. The interior will be dependent for its effect on the simple lines and detail, reinforced with marble and metals, and the coloring of the woodwork and furnishings.

A heating and ventilating system is formulated on modern scientific lines to serve the whole of the building and is planned to be effective during all seasons. Proper ventilation is a great factor to raise the working efficiency of the occupants of the room.

The central area is spacious, and no rooms will look into ill lit areas, but all have abundance of light. Effective doors are arranged for fire protection, and the interior will be hygienically constructed in every part. Materials and details are arranged so that the cost of maintenance will be reduced to a minimum. Practical and model contrivances will be installed to attain the standard of modern buildings. Particular attention will be given to modern hygienic apparatus and material, so that utility and comfort will be correlated and soundly conceived.

The contract for the erection of the structure has been undertaken by Messrs. Trollope & Colls, Ltd., 28 The Bund.

The architects are Messrs. Palmer & Turner of Hongkong, Shanghai and Hankow.

THE WORLD'S BIGGEST TIN DREDGE

[Continued from page 251]

Marshall engine connected to the gearing by a 20-in. Redaway camel hair belt. Water is supplied to the screen and boxes by an 18-in. centrifugal pump and a 12-in. high-pressure pump each direct coupled to a high-speed engine. These pumps and engines being built by Messrs. Thompson & Co., of Castlemain, Victoria, Australia.

The mooring winch is provided with six large independent drums driven by one engine. The ladder winch drum controlled by a separate engine is exceptionally large—being 6-ft. 2-in. in diameter. The object of this being to enable both ladder lines to work on the face of the drum all the time and so save wear on the ropes.

The forehead gantry, cantilever and ladder hoisting gear is all particularly strong and serviceable. The two 4-in. ladder lines run through five sheaves each both top and bottom, and lead on to the same drum. The dredge is designed to dig to 50-ft. below the paddock water level and the theoretical capacity of the plant based on 22 hours run is 7,920 cubic yards per day. An inspection of the dredge gives the impression of strength and serviceability and the general arrangement and construction of the machinery appears all that could be wished for. There is plenty of room on deck and the facilities for handling gear and arrangements for getting about are very satisfactory.

Except for the main engine, the electric lighting plant and the

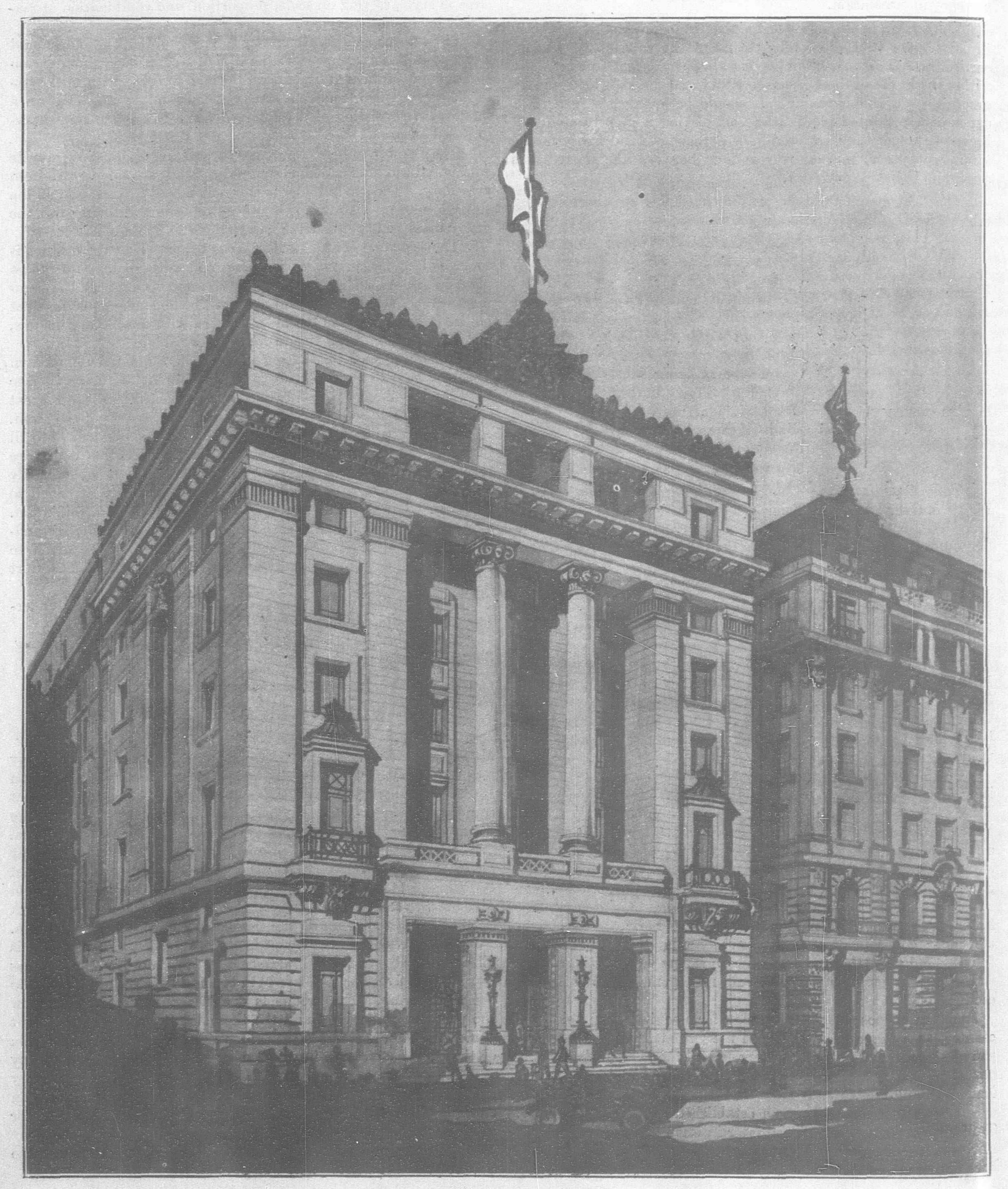
bucket pins, the whole plant was built in Australia.

YOKOHAMA SPECIE BANK NEW BUILDING

SHANGHAI

THE Yokohama Specie Bank, which is in the course of erection, displays in the design freshness and vigor in the strong masses and lines and in the use of Far Eastern motives.

The perimeter of the site is bounded on its north side by the Jardine, Matheson Building and the Yangtze Insurance Offices, [Continued on previous page]



Automatic Telephone System at Dairen

HAT promises to be initial step towards its gradual adoption in the larger cities of Japan is the new automatic telephone system just placed in operation in Dairen. A 500 line private exchange was completed last September in Tokyo by the engineer of the Automatic Telephone Manufacturing Company of Liverpool, which

is now being thoroughly tested by the experts of the ministry of communications, and to gather further first hand data and

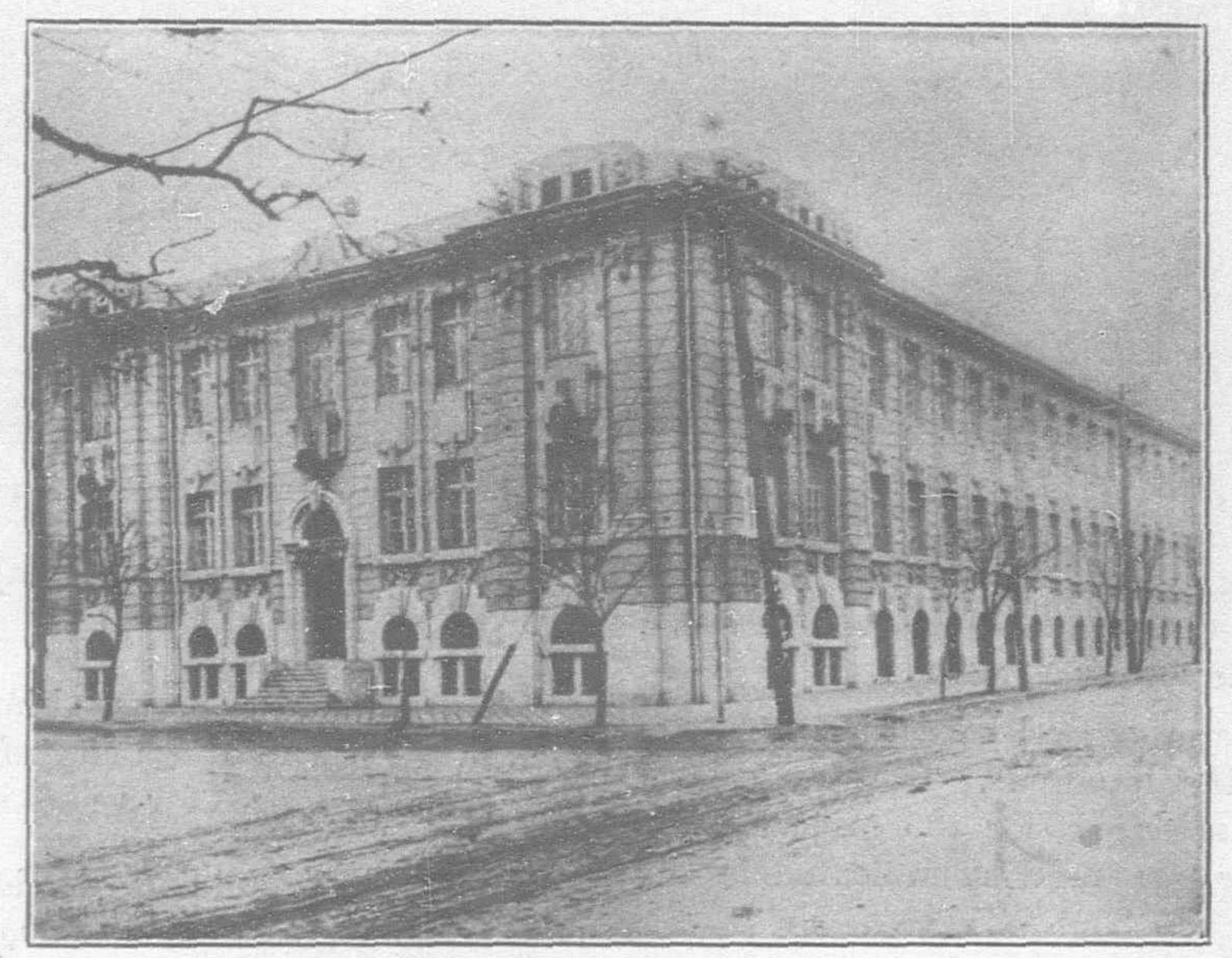
experience it was decided to install the same system in Dairen. The first complete automatic telephone system in the Far East was successfully placed in operation last year in Harbin by Mr. L. W. Smeltzer, engineer for the above company, where despite the linguistic difficulties the system has proved a complete success. Completing this contract he came to Dairen in March of last year to superintend the installation of the 5,000 wire system for the Dairen municipal authorities and it is now ready for operation.

The telephone system at Dairen dates back to the Russo-Japanese war (1904-1905). In a little over fourteen years, the local subscribers will have reached 4,000 the ultimate capacity for

the existing equipment. The Exchange soon became pressed for room, for installing more switch boards. The station had to be shifted and rebuilt, and the question of deciding upon the exchange plan was faced. At a new colonial city like Dairen, the telephone girls are constantly changing, the average term of their services being only seven months. In addition to the difficulty to recruit the candidates, their training is made all the more laborious because of the necessity to teach them enough Chinese and English to deal with the Chinese and foreign subscribers.

A study of the telephone traffic conditions then prevailing at Dairen showed that, except for the need of a heavy investment at the outset, the automatic telephone, compared with the manual system, requires much lighter expenses for up-keep, while making it possible to save the pay for the telephone

operators. In the long run, the automatic system was conclu ded to be more economical. Besides, the local climate, it remains generally dry, except in the rainy season of July and August This makes the use of highpressure electric current comparatively easy. Save for the actual operation and maintenance, there were left many points awaiting investigation, but it was agreed to experiment upon the



Telephone Exchange Building, Dairen

automatic system, which is to be the first to be adopted under Japanese management.

Of the several systems in existence, the Strowger system, was chosen, and orders for the plant placed with were the Automatic Telephone Manufacturing Co., Liverpool, through a Shanghai firm towards the end of 1920.

The Strowger system is the latest two-wire one of horizontal covered relay type, having the ultimate capacity for 10,000 indivi-

dual lines, exclusive of party lines. In the initial period, 5,080 lines are being actually installed, and 46-49 volts of the common battery system is used.

The line switch is of the rotary type, possessed of 25 bank terminals, each switchboard being equipped with the necessary connector and 100 lines. The telephone numbers are to consist of four figures uniformly.

The first level of the first selector connects with a special selector, in order to absorb the preliminary impulse, while the second level is provided against the future enlargement (five figures, instead of four, to be used in numbering the telephone apparati to be installed and the third selector will be needed).

From the third to the eighth levels have been appropriated for the subscribers to the apparati under installation at present. The ninth level is set apart for use as the outgoing trunk lines to the Shahokou branch station (equipped with the magnet-series multiple switch board with about 250 lines actually installed and 18 each of outgoing and incoming trunk lines.

The tenth level is for the trunk lines to the toll recording board. 4,600 lines belonging to individual subscribers, none of whom has a representative telephone number, 200 lines belonging to such as have representative telephone numbers and also have each a private exchange, and 280 lines serving as trunk lines to the private exchange totalling 5,080 lines, have been disposed of.

For the subscribers, each having a representative telephone number, and also such as have private exchanges of their own,

rotary connectors are These lines, used. compared with the ordinary lines, generally heavier traffic than ordinary load lines. When each switchboard accommodates 100 lines, the maximum number of connectors to be fitted thereto will be still found inadequate, and the lines to be installed may have to be restricted in number.

By the prevailing telephone traffic situation at Dairen, each



View of First and Second Selectors

switchboard requires 31 rotary connectors, even granting that it is fitted with only 70 lines.

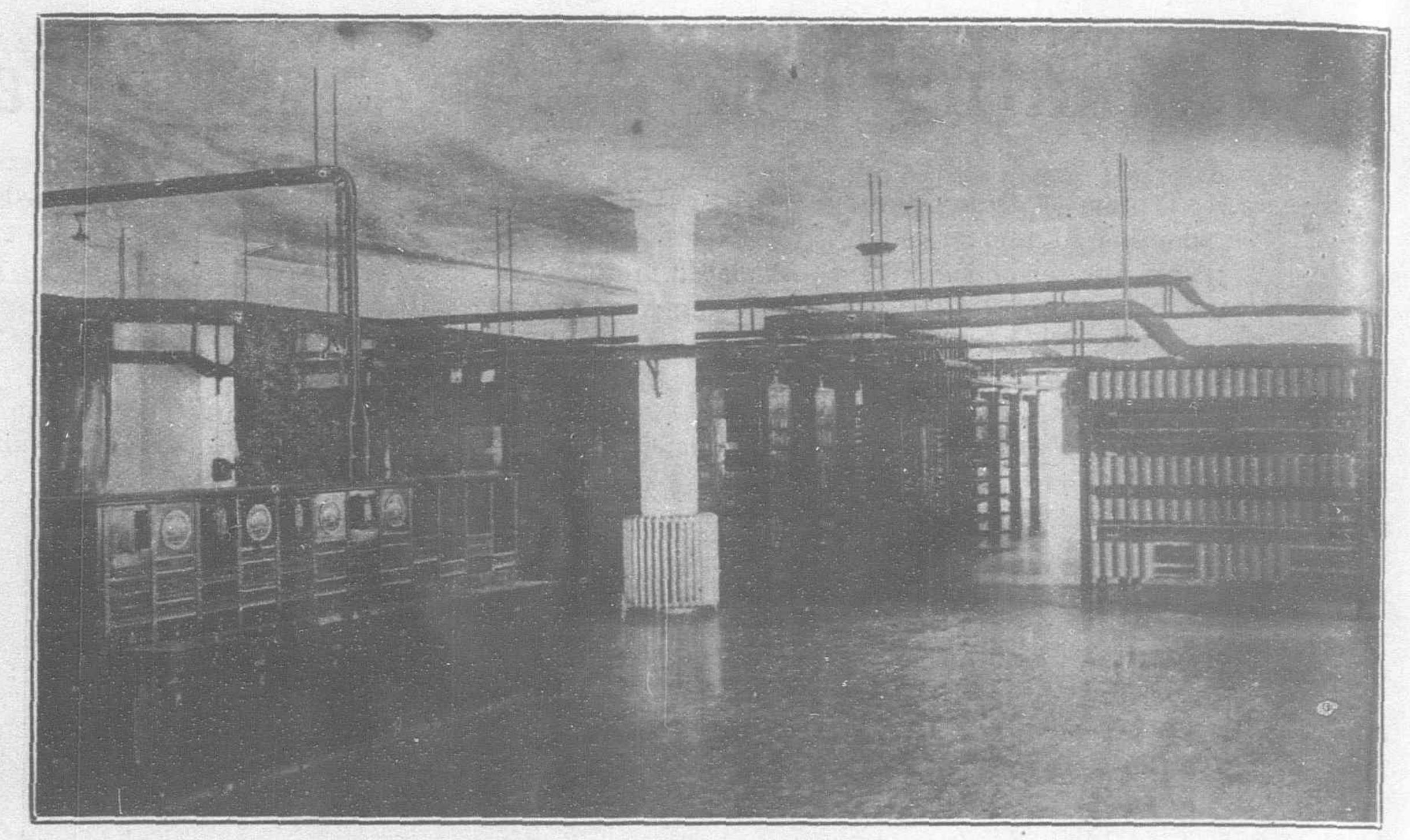
In passing, the maximum number of connectors to be installed for a switchboard is 32, with 8 switches and 4 shelves.

Thus, at present, 70 lines per board are regarded as the maximum.

SPECIAL TELEPHONE NUMBERS

The special telephone numbers are as follows:

		Spec.		
		Te	l. No.	
Toll Recording F	Board		0	
Shahokou Branc	h Sta	tion	9	
Fire and Police			19	
Test Desk			101	
Information Desl	۲		102	
Complaint Desk			103	
Time Service			104	
	Previo			



General View of Automatic Telephone Exchange at Dairen

Remarks: The number for calling the test desk is not published. It is used in direct communications between the repairing gang and the testers concerned.

The second selectors are for the general subscribers and are to answer the requirements of the hundreds. How each level of the special second and third selectors (for the exclusive use by the central exchange people) is used as indicated in the trunking diagram (Plan 1).

The numbers of the trunk lines between the line switches and the different desks are as follows:

	No. of Trunk					
				Li	nes.	Where Installed
Toll Recording Boa	rd				10 7	Test Desk.
Toll Board					33 7	Foll Board.
Dead Number Servi	ice				10 I	information Desk.
Information Desk					10	,,
Fire and Police					1	22
Complaint Desk					5 (Complaint Desk.
Hospital					1	,,,
Inspectors' Trunks	• •				11	
Test Distributors					6 7	l'est Desk.
Test Trunks to Main		THE WAY SHOULD BE A STATE OF THE PARTY OF TH				22

As to the disposition of 34 outgoing trunk lines from the toll desk to the automatic telephone service, for each of the four groups of 1,000 lines each, having P.B.X. trunks, 6 lines are assigned, and for each of the two groups containing no P.B.X. trunks, 5 lines are allotted, making the total 34 lines, which are made to connect direct with the second selectors.

The trunks for the dead numbers are to be kept connected with all cases of withdrawal from subscription, changes of the numbers, etc., so that any one calling any of these numbers may be informed to that effect.

The Mantetsu General Hospital

GROUND has been broken for the construction of the Mantetsu General Hospital at Dairen, and building operations have started on such a scale that the completion of the immense group of buildings may reasonably be expected within two years.

The site for the proposed improvement is on a plateau of solid rock in the centre of the city of Dairen, and has every advantage that could be desired for an institution of this kind.

A fireproof building of reinforced concrete, five stories high, and containing some 1,800 tsubos of floor space per floor, has been designed, and many special features have been incorporated in the plans to make the service efficient for the patient and convenient for the medical staff. Five electric elevators and seven enclosed stairways will insure comfortable service to all parts of the buildings, which is divided into the customary hospital departments, and includes a large assembly hall and library.

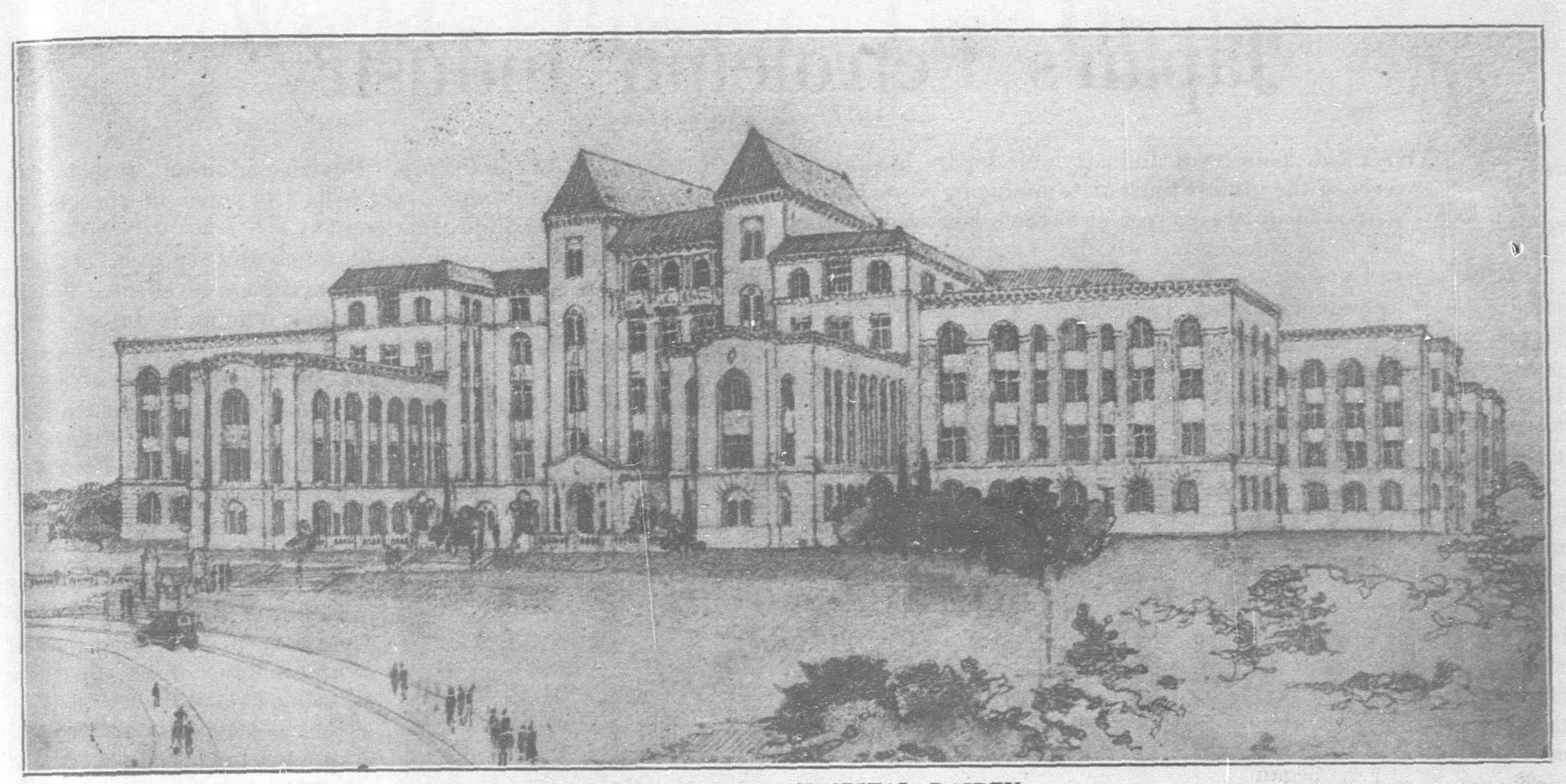
The major operating rooms are on the fifth floor, and arranged in such a manner that several operations may be had at the same time. These, in addition to special operating rooms, located in different departments and making a total of twelve in number, will render ample service for the institution now and in the future.

The building is divided into two parts consisting of suites and departments for the treatment of out-patients, as well as four separate ward units for medical and surgical patients.

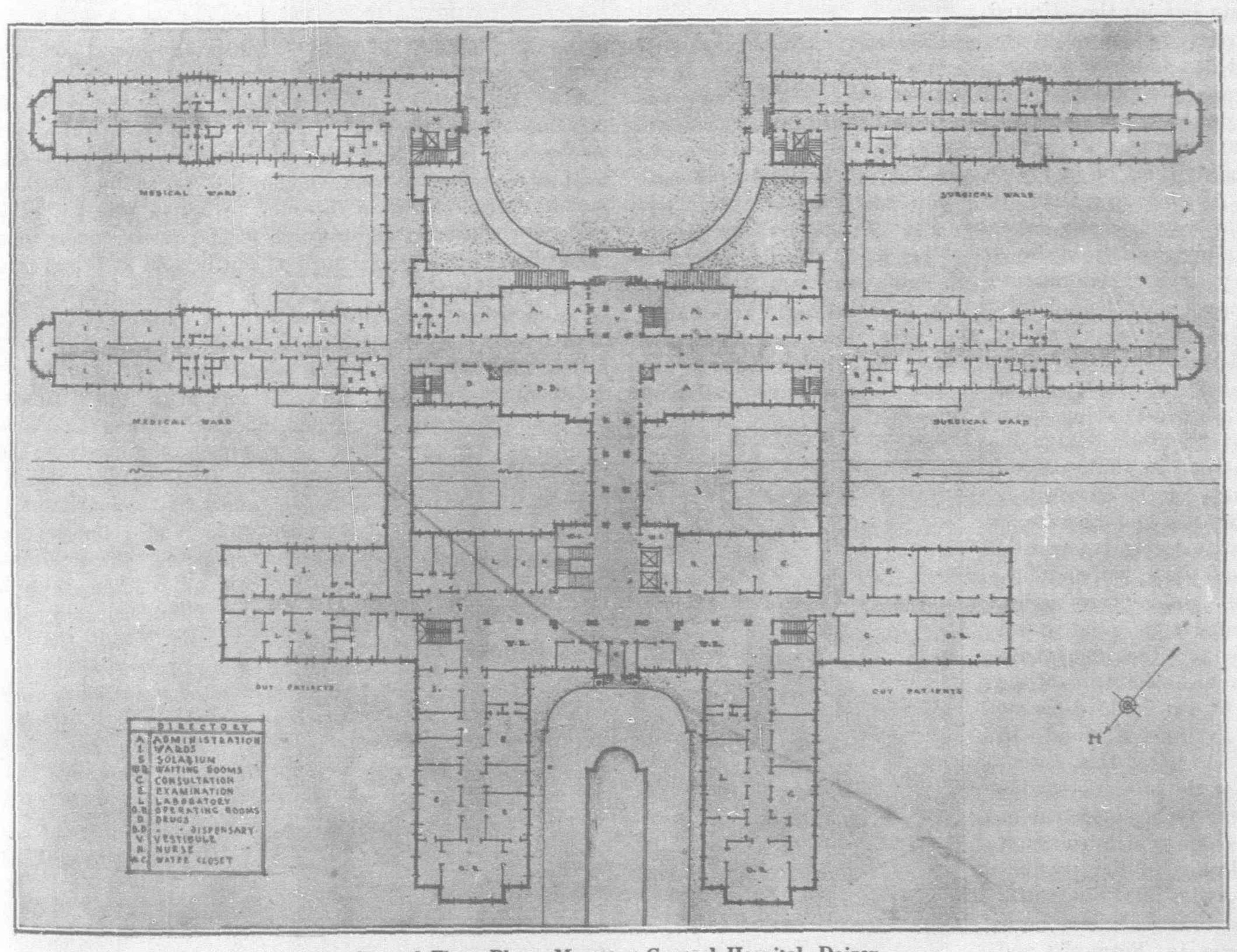
Manchurian granite, tapestry brick and terra cotta will be used on the exterior, which will be imposing and of high architectural character. The partitions throughout will be of hollow tile or metal lath and plaster. Marble, tile and other high grade materials are used extensively.

A tunnel will connect the various new buildings to those already in operation on the present site, and a new power house will be built to furnish steam for heating purposes. The heating of certain parts of the buildings will be by means of filtered and washed air conveyed by ducts, motors and fans to the various rooms, insuring a constant change of pure and tempered air irrespective of the season or temperature outside. A large solarium and roof garden is provided on the roof and arranged for use in summer as well as in winter.

The buildings are being erected under the supervision of the George A. Fuller Co. of the Orient, Ltd. for the South Manchuria Railway Company, and when completed, together with the present buildings and those contemplated in the future, will give Manchuria a plant the like of which does not at present exist in the Far East.



MANTETSU GENERAL HOSPITAL, DAIREN
Under Erection by the Geo, A, Fuller Co, of the Orient, Ltd.



Ground Floor Plan: Mantetsu General Hospital, Dairen.

for its purpose, the storage of

imported crude oils. From this

it is certain that this great com-

bine which was intended to

develop the domestic petroleum

resources, has found it essential

in order to ensure its continued

prosperity to turn its attention

to the refining of imported oils

for sale on the domestic market.

If the present rate of increase

in production of crude oil in

the United States, especially in

California, continues uninter

rupted, the effect on the Japa-

nese oil market can only be

United States began to decline

When crude oil in the

seriously adverse.

Japan's Petroleum Industry

HAT the petroleum industry of Japan has about reached the utmost limit of its producing power is foreshadowed by the merger of Japan's largest oil enterprise, the Nihon Sekiyu K. K. (Japan Petroleum Co., Ltd.), with the Hoden Seikyu K. K. The business results shown by the combination, however, have been most unsatis-

factory to the shareholders. Dividends have decreased from 42 per cent. in September, 1921, to 15 per cent. in September, 1922, although out of profits there has been a considerable reduc-

tion of fixed capital accounts effected.

Decreased profits have been caused by the sharp fall in the market prices of oil during the past year. Comparing prices at the end of September with those in January, there is a decrease of 30 per cent. Compared with the high prices during the war, there is a decrease of more than one-half. Owing to the declining prices this company began to restrict production, thus adding to the loss of profits.

The cause of the fall in market prices is largely to be found in the great accumulation of oil stocks in the United States directly influenced by the decreased demand from Europe,

and increased production at the American wells. At one time the stock of petroleum on hand in the United States was more than 250,000,000 barrels. Eventually there was a sharp decline in quotations in the United States and this affected the Japanese market. At the same time the cheap American petroleum was making its way into the Japanese domestic market, materially influenced by the fall in freight rates across the Pacific. Due to a very active manufacture of light oils from the cheap imported crudes, the supply of this grade of oil rapidly swamped the market, and as a matter of course, market prices went lower and lower, and very sharply at that. Oil for lighting was also adversely affected, and all in all, the Japanese petroleum industry has been having a hard time of it.

When the Nihon Sekiyu K. K. was formed in 1921, one of the purposes of the merger was to unify the drilling operations of the two merging companies, and to regulate and unify production in the different refineries. At the same time great stress was placed on the importance of continuing exploitation of the oil fields owned in 25 different localities in Japan, and in Formosa. Despite this intention, one of the most noticeable items in the term statement of account is one which shows a gradual decline in the production of crude oil. Since the merger two new wells have been opened, one in Formosa, and



Nagaoka Oil Fields: Hoden Oil Company

of a huge oil tank depôt near Yokohama, which could only have

tendency to a decline in production.

in price, several companies were at once organized in Japan to import American crudes for refining. Since the price of refined oils has fallen so low in Japan, these companies have been also coming in for their share of unhappiness, as most of them are unable to refine at costs under the prevailing market prices. Should crude oil abroad continue to fall in price, it is doubtful, even, if it will be at all profitable for Japanese refiners to continue in business; imports of refined oil can be sold at prices below their costs of production.

the other in Akita prefecture. But the addition of their flow

to the general production has not helped to stave off the general

nese oil refiners will be more and more adversely affected by the

importation of cheap foreign crude oil for refining in Japan. This

possibility has evidently alarmed the directors of this company,

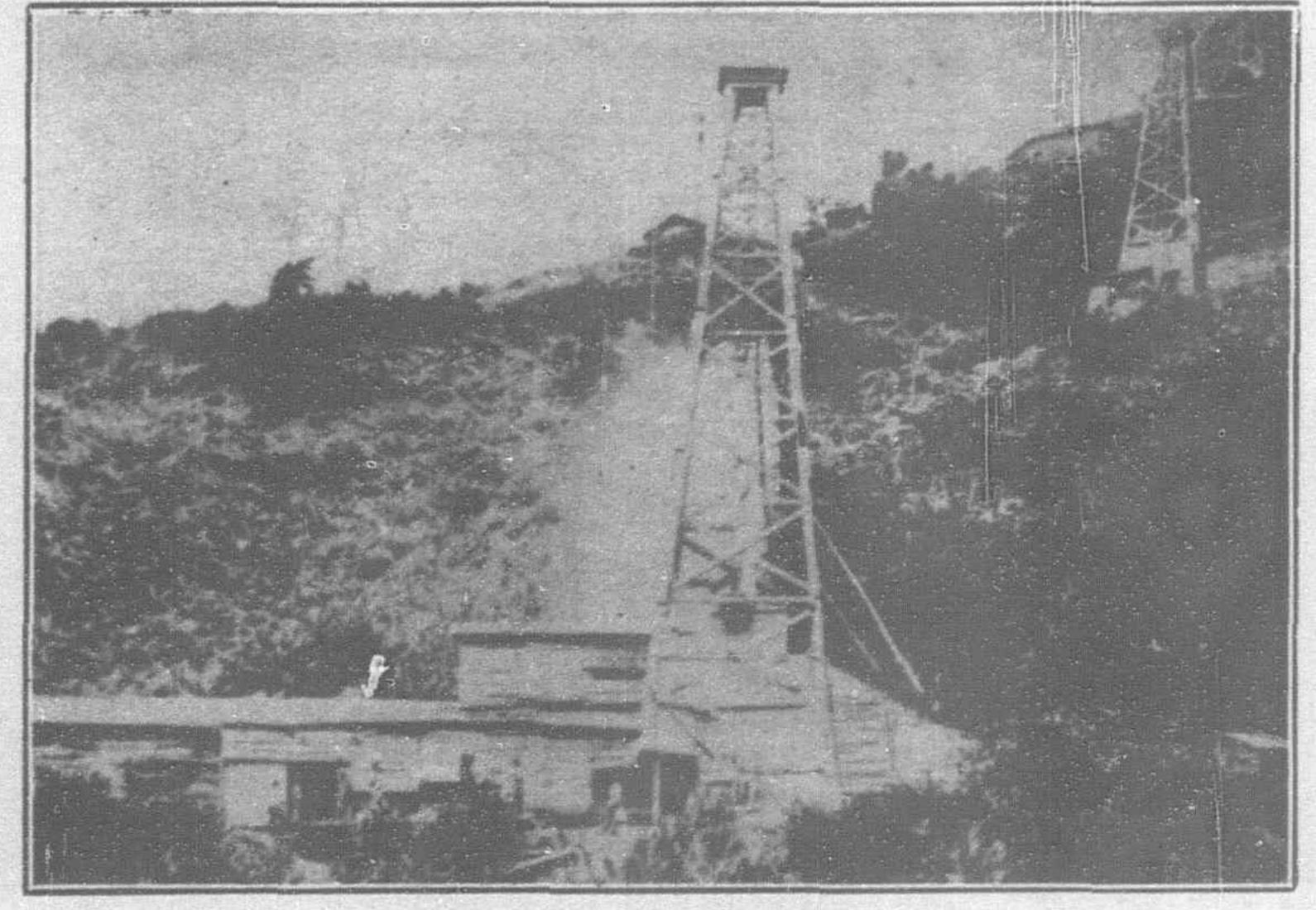
for one of its most recently announced plans, is for the construction

If this decline in production continues, the condition of Japa.

Japan has had a bitter experience in the petroleum business in past years. At the close of the Russo-Japanese war, Mr. Soichiro Asano, who has since become one of the leading business men of the country, entered into contracts with three American eil companies to purchase crude oils for refining in Japan. Mr.

Asano organized the Tozai Oil Co., Ltd., to refine these imports, and the construction of oil tanks and refineries had been completed, when these three companies were absorbed by the Standard Oil Company, with the result that the contracts were abandoned. Even if Japanese refiners could make satisfactory contracts with American producers to-day, is there any assurance that there will not be a recurrence of the former experience?

The general impression in Japan to-day is that there is little hope of a prosperous future for the domestic oil refiners.



Oil Wells in Formosa

World's Biggest Tin Dredge

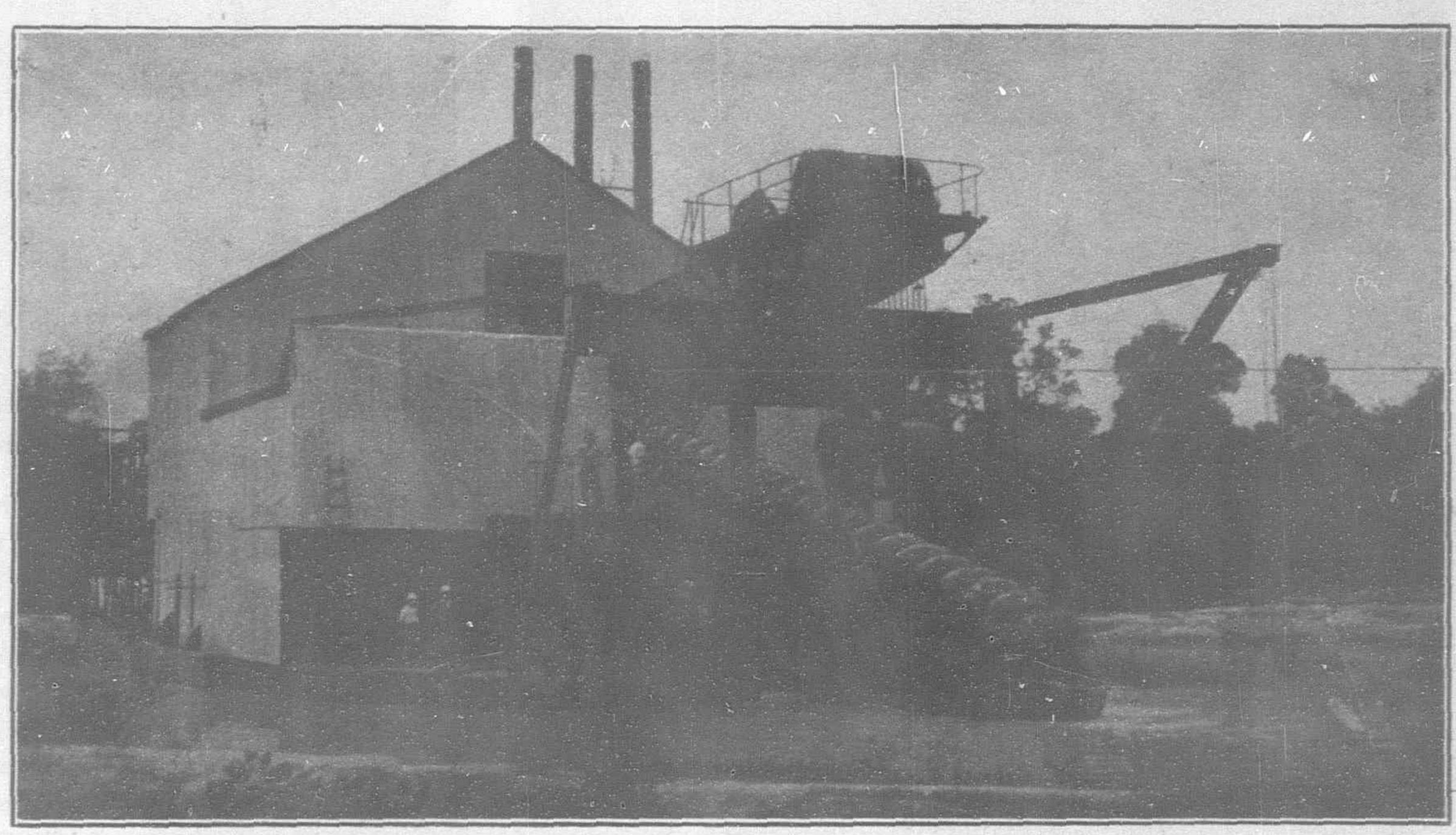
At Work in Malaya

By R. N. Goodwin

GIGANTICtin bucket dredge built in Australia, regarded as the largest, most powerful and most up to-date of its kind in the world, was placed in operation on January 30 last. It belongs to the South Taiping Tin Dredging Co. (1922), Ltd., whose registered head offices are at Penang and it has been erected on the company's property near the town of Taiping in the state of Perak, F. M. S., costing approximately £95,000 to build in Australia, the total amount expended in transport, erection, etc., brought the total sum spent to instal it in working order on the mine, to about \$1,000,000. The dredge was christened the "Arthur H. Miles," after the consulting engineer, by his wife in the presence

of a large concourse, which included representatives of the mining munity drawn from all parts of Malaya. An inspection of the dredge when its machinery was set in motion gave a sense of tremendous power, great solidity and enormous capacity. The spacious deck with the cantiliver rising 40-ft. above, the long ladder, endless chain of huge buckets and the big projecting chutes all contributed to create the impression of a terrific concentration of mechanical energy. After the working of the dredge had been explained, the visitors proceeded to the new club, Taiping, where they were the guests at tiffin of Mr. Syd. D. Miles, the general manager, who has furnished the following detailed technical description of the dredge:—

The dredge—built in Australia by Messrs. Chas Ruwolt Propty Ltd., Melbourne—is the close connected bucket band type designed to dig and treat, what in Malaya is considered abnormal yardage. The hull is of steel 150-ft. long, 58-ft. 7-in. beam and 10-ft. 1-in.



Bow or Bucket End of the South Taiping Tin Dredging Company (1922), Ltd.'s New Dredge.

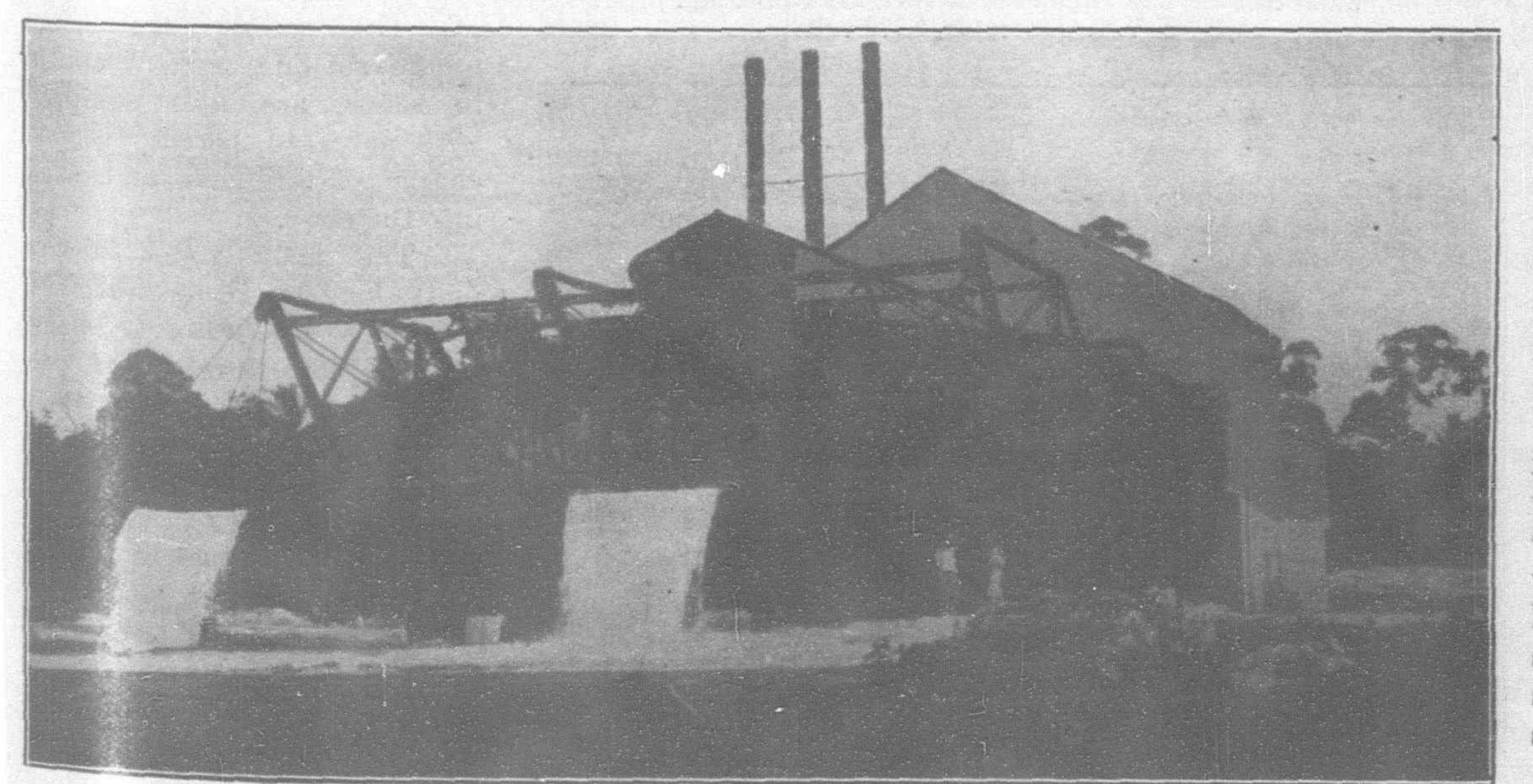
deep in the well. The ladder is 96-ft. long, 6-ft. 5-in. wide with a depth of 6-ft. 7-in. in the middle. It weighs, when fitted with ladder rollers, chafing beam rollers, etc., about 60 tons. The bottom end of the ladder is fitted with a round tumbler weighing 9½ tons, the wearing ends of the tumbler shaft are protected and run in grease. The top tumbler is hexagonal and is lined with manganese wearing strips.

The buckets 9 cubic feet capacity are cast steel with manganese steel lip and wearing strips connected with one manganese steel pin, 4-in. diameter at each end. There are 82 buckets in the band, weighing 90 tons. The total weight of the ladder rollers, bottom tumbler, buckets, bushes and pins amounts to 165 tons.

The buckets feed into a suspended drop chute and from there all the *karang* and overburden passes into a revolving screen 48-ft. long and 6-ft. 8-in. in diameter. There are six tin saving tables or "boxes" on each side of the screen with a total area of 4,032

square feet. In addition to these there are three auxiliary boxes on the deck underneath and a "Saveall" box, making a total concentrating area of 5,044 square feet. At the end of the boxes on each side is a chute projecting 20-ft., which in addition to facilitating stacking of tailings is a considerable help in saving tin during the clean up.

Steam is provided by three internally fired dry back marine type boilers, built by Messrs. Chas. Ruwolt which are fitted with super-heaters. The total heating surface of boilers and super-heaters amounts to 2,984 square feet. The buckets and screen are driven by a 35 h.p.



Stern View of the New Dredge for the South Taiping Tin Dredging Co. (1922), Ltd.

(Continued on page 245).



The Hobetsu Power Plant of the Hokkaido Electric Light Company; 3,500 K.V.A.; 4,000 h.p.; 232,5 feet head



Intake of the Hobetsu Power Plant

A Hydro-Electric Plant in Hokkaido

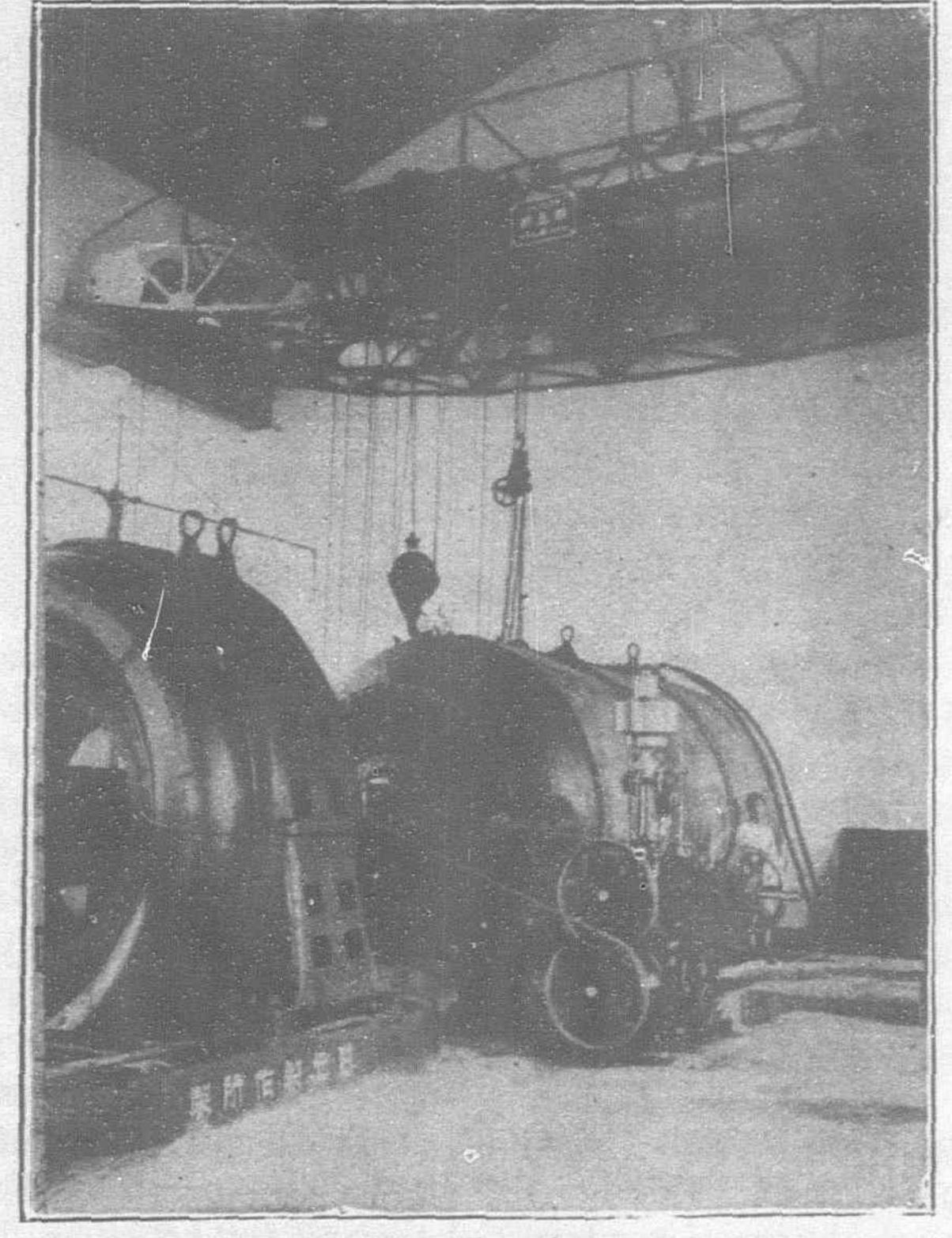
A Hidachi Installation

IN the general competition for the L equipment of new electrical plants in Japan, the Japanese manufacturers of electrical machinery are making a keen bid for the business and constantly increasing their lead. In our last number we mentioned some of the recent installations of the Hidachi Engineering Works and are now able to give the details of one of their typical smaller hydro-electric plants erected for the Hokkaido Electric Light Co., Ltd.

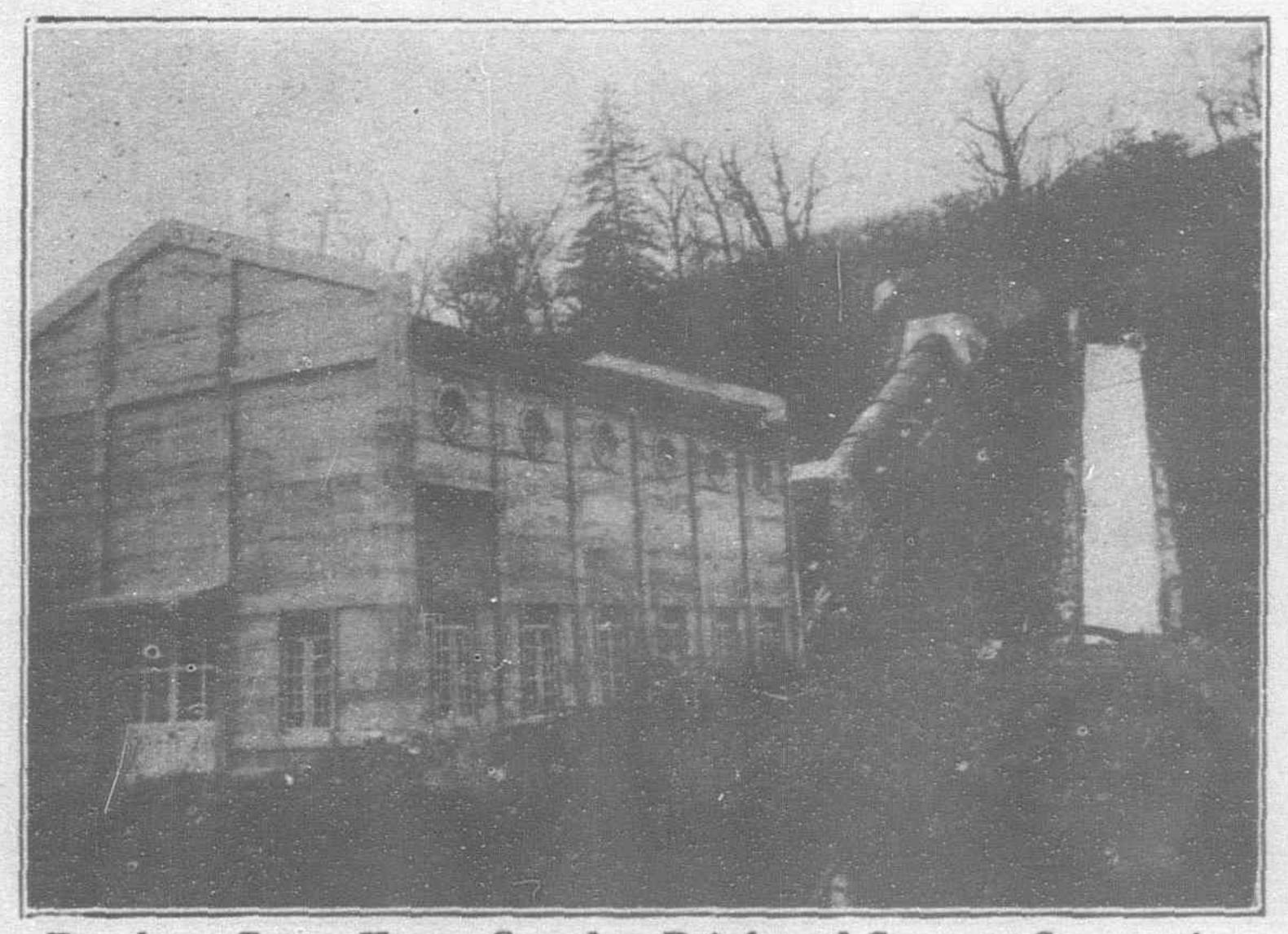
This company operates steam, gas and hydro-electric plants and supplies light and power to various districts in the Teshio, Kitami, Tokachi and Kushiro provinces. It is capitalized at Y.21,635,000, half paid up. Its last dividends were 12 per cent. The steam plants generate 375 k.w., gas, 529 k.w., and water, 15,870, k.w.

Their latest installation, called the Tetsubetsu power plant, is located at Hobetsu in Kushiro province taking its power from the Hobetsu River. This plant was designed to transmit power to the Hobetsu station of the same company, which stepsup the voltage to 55,000 volts. The Hidachi Engineering Works secured the contract for the complete equipment of this plant with a total capacity of 2,200 kilowatts, of which, 1,900 is for general power supply and 300 for special purposes.

The licensed head of water on the river at this point is 400 cubic feet, each turbine requiring this maximum head. The



Generating Room of the Tetsubetsu Power Plant of the Hokkaiko Electric Light Company. "Hidachi" water turbine, 3,320 h.p. head 85 feet, 375 r.p.m. and 2,750 K.V.A. Generator, 6,770 volts



Tetsubetsu Power House. Complete Reinforced Concrete Construction

difference in level between the intake and the water gate is 100 feet with an effective head of 84-ft. The dam itself, of stone and reinforced concrete, is 70-ft. long by 8-ft. high with a top width of 41-ft. and bottom of 20-ft. At the right side of the dam is an emergency water gate to permit sand and rubbish to be washed away as required. The water gates are constructed in a series of four 8-ft. in width and with side walls 31-ft. high, corresponding with the depth of the water in front of the gate. The flowing in at the No. 1 intake is directed to the first settling pool equipped with two gates at the left and bottom in order to return to the river the sand and sediment. From this pool the water flows through a tunnel and over a bank 45-ft. wide falling into the second settling tank or pool, four feet lower than the tunnel level. The tunnel from the first pool is built of concrete, horse-shoe shape, 6,996-ft. in length, height 9.75-ft., width 9.5-ft. and 8-ft. at the bottom, with a gradient of 1/1200. The depth of water will be eight feet. The second, third and

> fourth settling tanks, installed in series, are also equipped with gates to permit the discharge of sediment and sand into the river.

> The main water tank is 65-ft. long by 16 to 25-ft. wide in which the water is maintained at a level of 11 to 15-ft. It is equipped with a nine feet diameter iron discharge pipe with a valve to regulate the flow. For 42-ft. from the exit of this pipe there is an overflow bank with a water gate for turning out sediment, and for sudden emergencies to divert the whole head of water into the river again. The

(Continued on page 271)

Tientsin-Pukow Trains de Luxe

HE Tientsin-Pukow Railway have recently replaced their old wood express trains, operating between Pukow and Peking, with five modern de luxe new semi-steel trains which were supplied by the Pressed Steel Car Co. of New York. Each train consists of one each baggage car, postal car, dining car and drawing room car and two each first-, second- and third-class coupé sleeping cars. Three new semi-steel private cars, supplied by the same builders will shortly

be placed in service for operation with the new trains.

These cars of American manufacture represent the last word in modern car construction, and afford the latest facilities for the comfort and safety of the traveling public. They not only excel the best trains in Asia, but will compare favorably with any in Europe or America. The order is the largest and most important for high-class export passenger equipment and was the result of an invitation extended several years ago by the Tientsin-Pukow Railway authorities to several leading car builders to submit designs and send an engineer to China with samples, etc., to recommend, discuss and settle details with them for first-class passenger car service.

The Pressed Steel Car Co. opened an office in China during 1919, under the general management of Mr. H. R. Cooper, with a qualified engineering staff to cope with any problems pertaining to either freight or pasenger trains, and in due time their chief engineers, after many conferences with the various department heads of the railway, worked out preliminary plans and specifications to meet not only the requirements of the railway company, but also conforming to the principal dimensions and fundamental features as decided upon by the commission on railway technics, consisting of a number of foreign railway advisers working under the jurisdiction of the ministry of communications for the purpose of working out standards for the railways of China, after conferences with the mechanical heads of all the railways of China. It might be mentioned that Mr. Shu Shih-chang, former managing director, in line with the other progressive improvements that he had under way on the Tientsin-Pukow Railway, at the time, made it clear that he wanted trains the superior of any in Asia, and the results are due to his initiative.

The proposition of settling details and insuring that the trains came up to the expectation was placed in the hands of Mr. Tsai Kuo-tsao, former chief locomotive and works superintendent, one of the most capable, energetic and conscientious Chinese that has occupied an important motive department position on the Chinese railway. The various features and details were developed after numerous conferences between Mr. J. Alston, Mr. Tsai Kuotsao and Mr. W. M. Peach, chief engineer, Far Eastern district, for the Pressed Steel Car Co., as well as interviews with the heads of the traffic and dining car departments. The final decisions, approval and selections of samples were made by Mr. Tsai, through whose efforts and judgment the arrangement, design and appearance of the trains are as the traveling public find them.

Due to the time required in settling the various details, discussions at various standardization conferences and the rapid deterioration of the old equipment, the contract was placed promptly with the only company having a qualified engineer on the ground to communicate to the works the voluminous details that had been discussed. The order was placed through William Forbes & Co., Tientsin, late in July, 1921 and the first twenty-five cars delivered at Pukow during August the following year and delivery completed in October.

The cars were built at Pittsburgh and Wilmington. The cars were erected at the builder's works under the inspection of the well-known British firm of engineers and inspectors, C. P. Sandberg & Co. The cars were lettered, ornamented, painted

and varnished, after which they were dissected and shipped in sections; the underframes being shipped in three pieces; each side in four sections with windows, curtains and glass assembled; each body end with door assembled was shipped complete, likewise the vestibule ends. The interior partitions were also shipped assembled with glass, etc., in position.

On arrival in China, the sections and parts were assembled at the Tientsin-Pukow shops at Puchen under the direction of Mr. John Alston, locomotive and works superintendent of the line. The erection was started September 1, 1922, and the trains were ready for service about the middle of January, a record for this volume and type of equipment.

The cars conform to the following principal dimensions:—

Sleeping Cars and Drawing Room Cars.

Length over body				65'	73"
Distance between bog	ie centi	res		51'	10"
Length overall couple	d in tra	in		74'	1"

Baggage Cars and Postal Cars.

Length over body		65'	73"
Distance between bogie centres		49'	21"
Length over all coupled in trains		67'	$2\frac{1}{2}$ "

Dining Cars.

Length over body				72'	$6\frac{1}{4}''$
Distance between bogie	centres.			54'	51"
Length over all coupled	in train		• •	75'	5"

Private Cars.

Length over body				67'	$7\frac{1}{4}''$
Distance between bogie	centres.			53'	91"
Length over all coupled	in train		• •	77'	$3\frac{3}{4}''$

All Cars.

Width over side sheathing	 	 10' 0"
Width over eaves		 10' 13"
Top of rail to top of roof		 14' 2"
Wheel base of bogie		 8' 0"
		F1# 1

The general design for all the cars is the same, as follows:

Under Frame

The underframe is of the through four sill type. The centre sills are 12-in. eye beams, 31½-lbs. spaced 16-in apart. The side sills are 10-in. ship channels 28-lbs. The body end sills consist of ½-in. web plates with a continuous 18-in. by ½-in. top anti-telescoping plate. The platform end sills are of cast steel.

The body bolsters or transoms are the two member forged truss type, each member consisting of a 10-in. by $\frac{3}{4}$ -in. top and a 10-in. by $\frac{7}{8}$ -in. bottom tie. There are four cross ties or needle beams to each car consisting of a 13-in. by $\frac{3}{8}$ -in. top tie plate and a 7-in. channel $9\frac{3}{4}$ -lbs. bottom member with two $\frac{1}{18}$ -in. web plates. The intermediate cross ties or floor supports are 5-in. channels $6\frac{1}{4}$ -lbs.

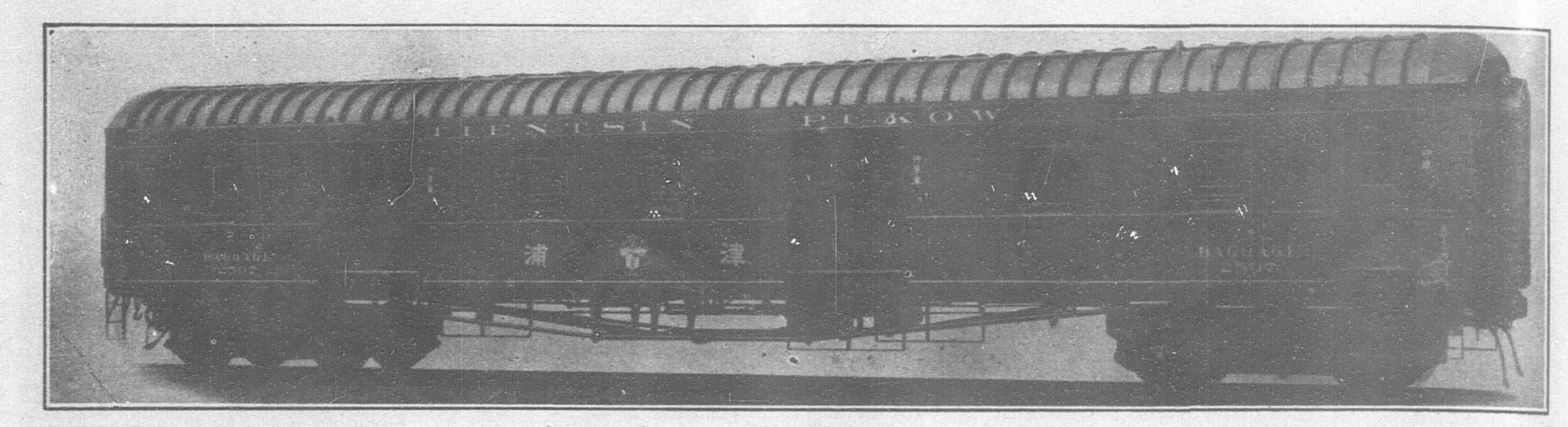
The baggage cars and postal cars are trussed with four and the other cars with two 2-in. truss rods, which were introduced to allow of maximum amount of assembly including painting and varnishing before shipment, and thus reducing the work at destination to a minimum.

Body Construction

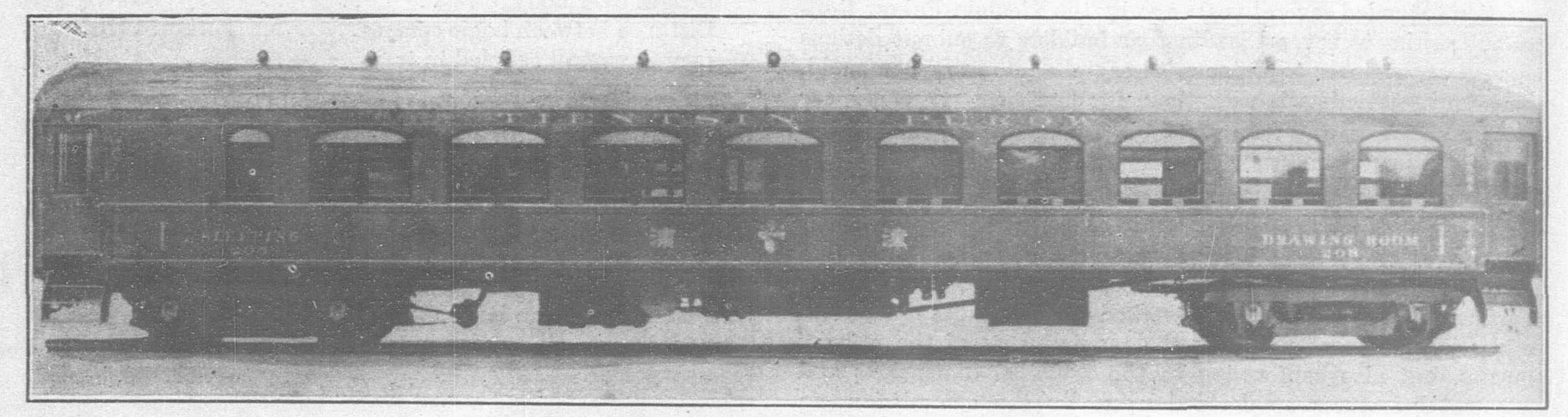
The vertical members of the side frame are 3-in. by 2-in. by 1-in. angles extending from side sill to side plate, the spacing being arranged to suit the window and door openings for the

THE CARS FOR THE FIVE TRAINS DE LUXE FOR

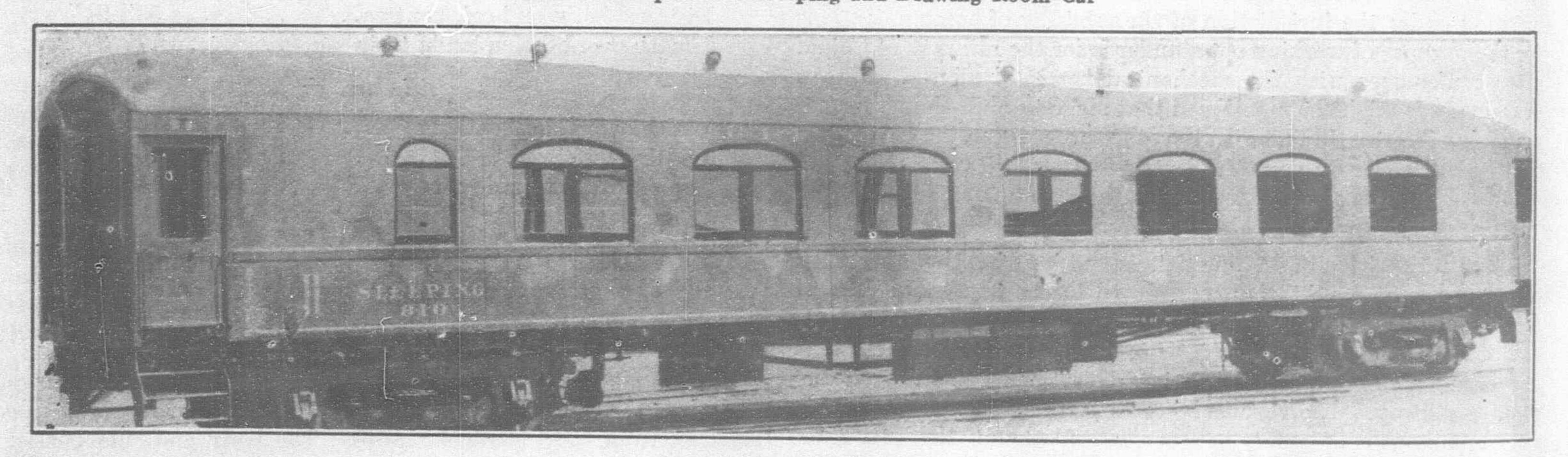
Supplied by the Pressed Steel Car Company with Erected at the Puchen Shops of the Tientsin-Pukow Railway Under the



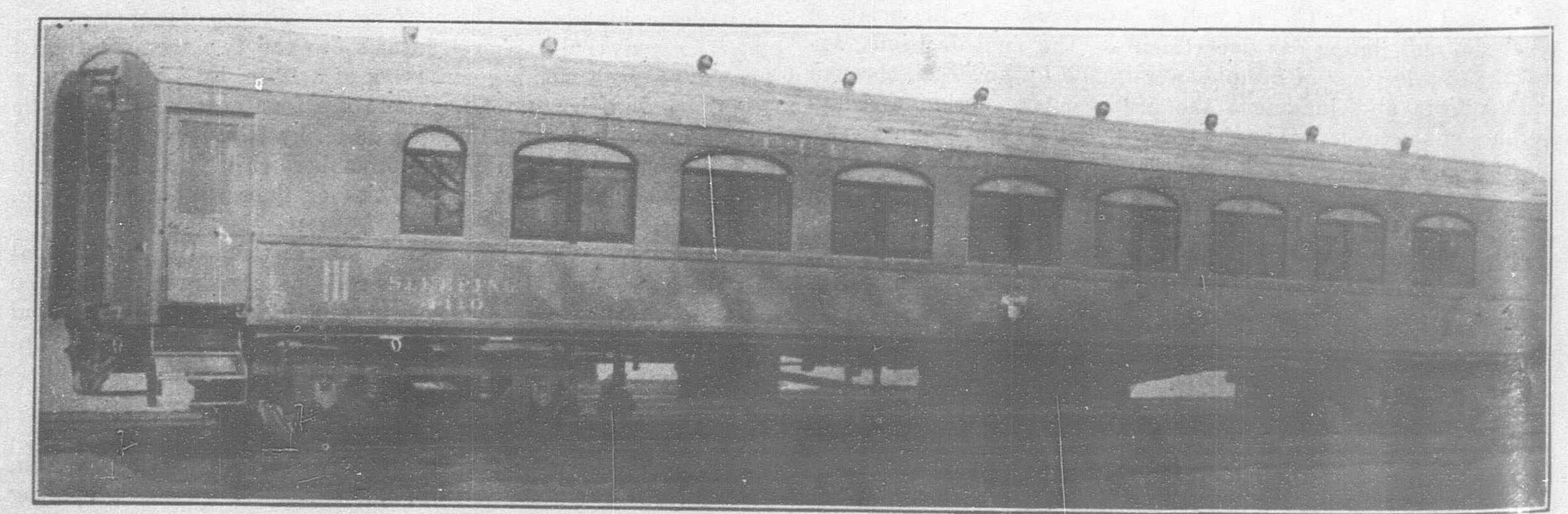
Baggage Car



1st Class Compartment Sleeping and Drawing Room Car



Second Class Sleeping Car

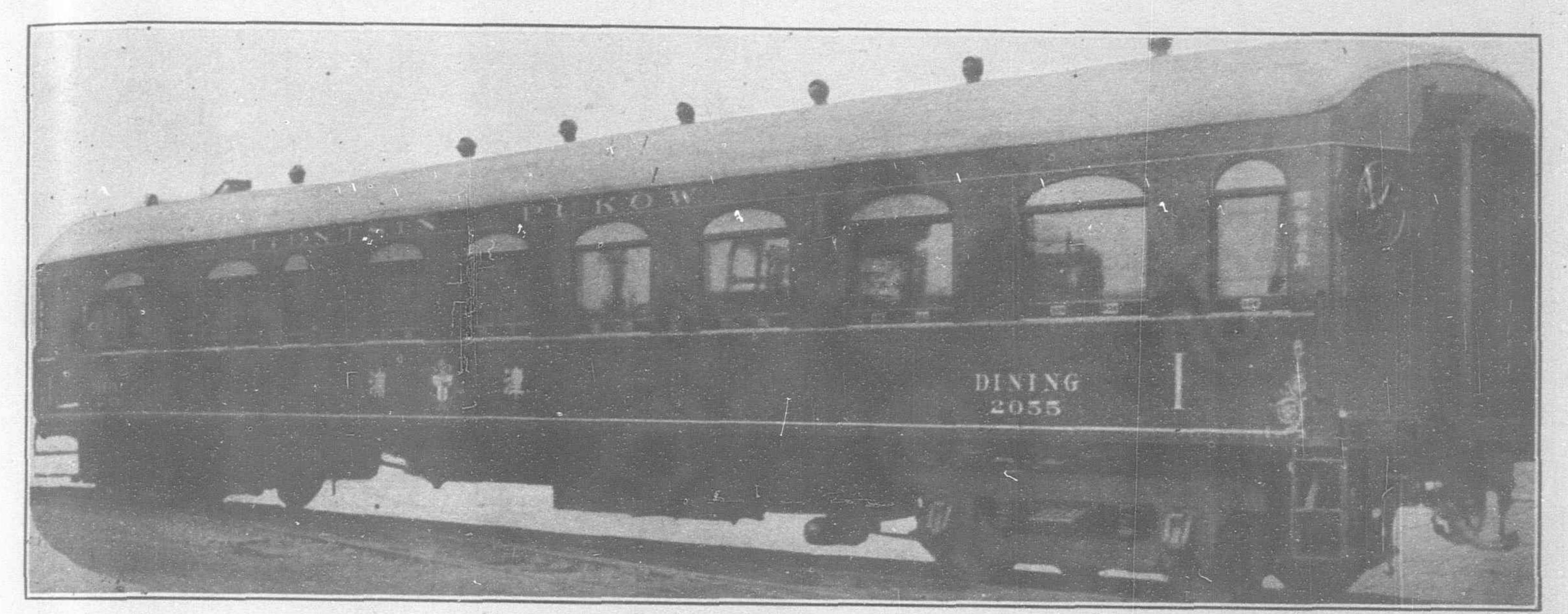


Third Class Sleeping Car

SERVICE ON THE TIENTSIN-PUKOW RAILWAY

Materials Supplied by the United States Steel Corporation

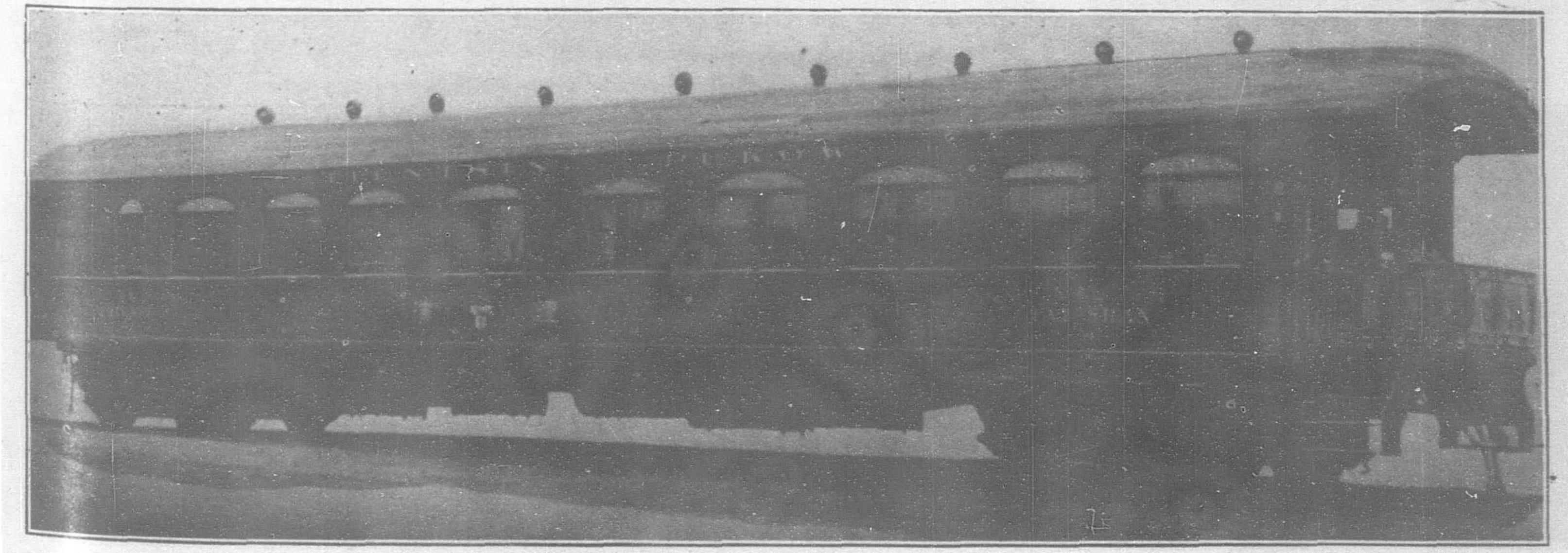
Direction of John W. Alston, Locomotive and Works Superintendent



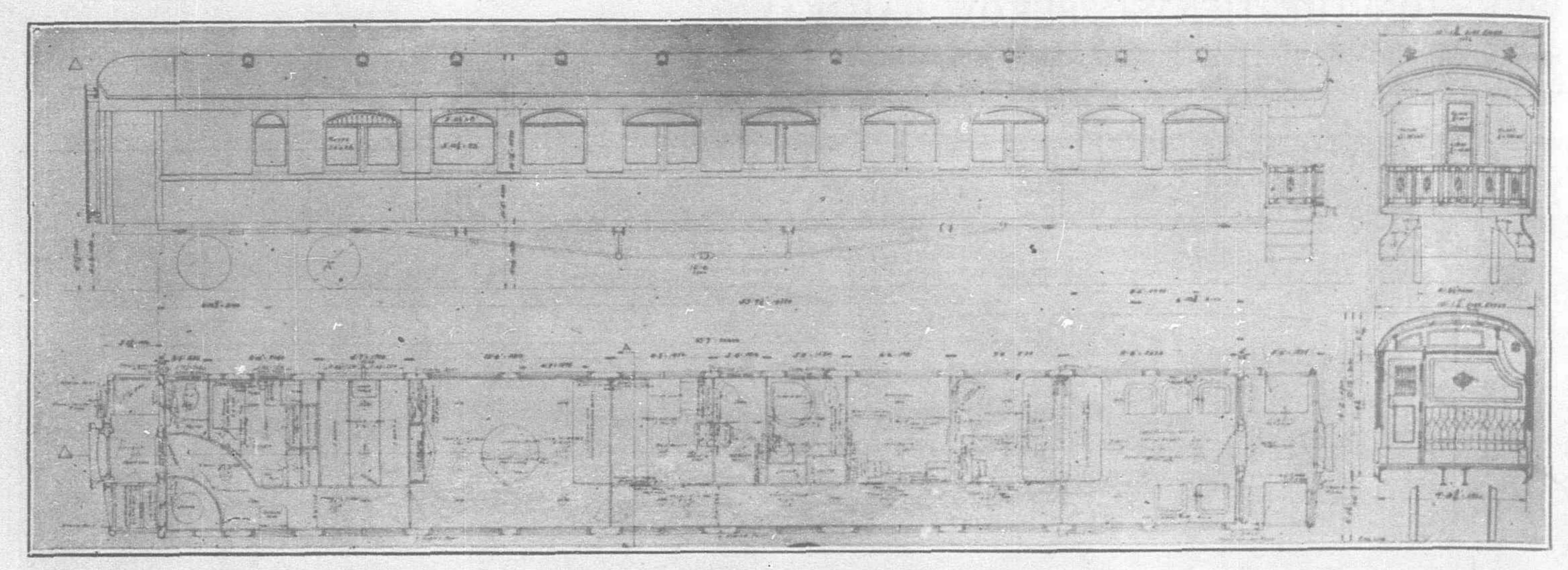
Dining Car



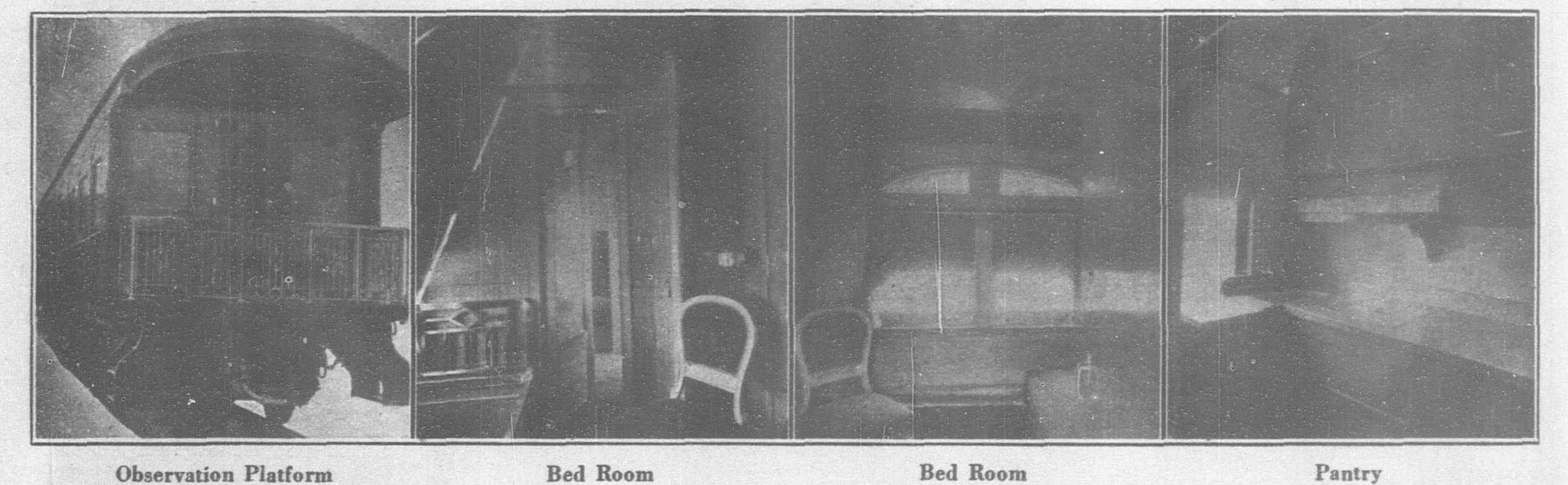
1st Class Sleeping Car



Private Car "Tai-Shan"



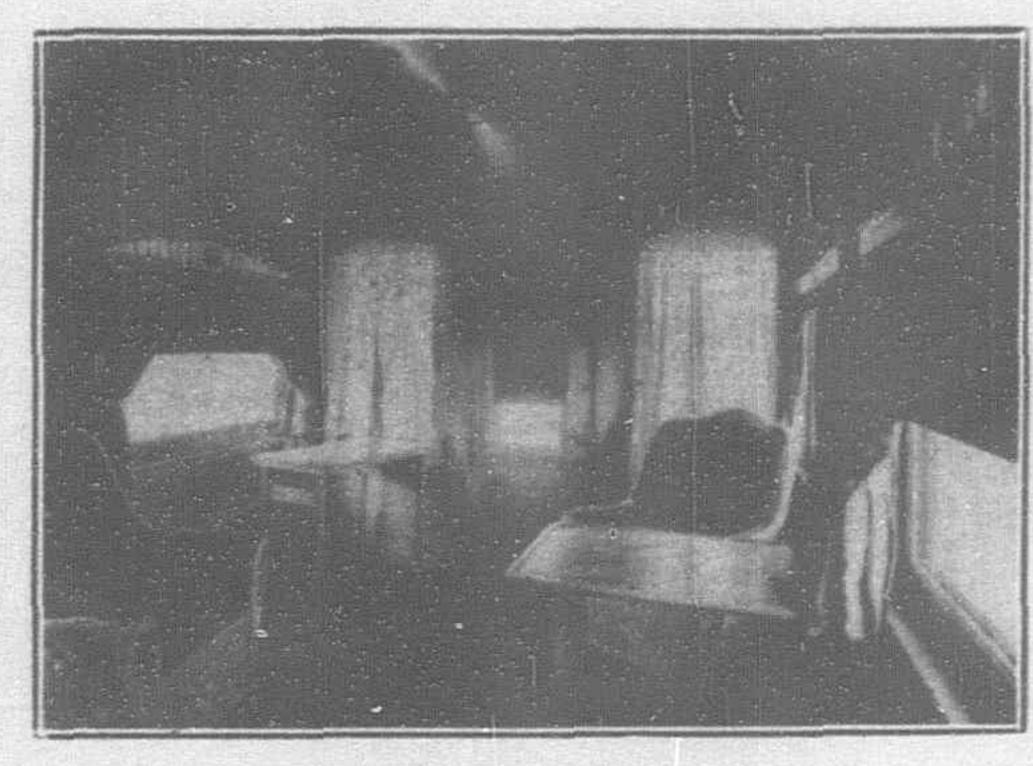
Private Car "Tai-Shan". General Floor Plan



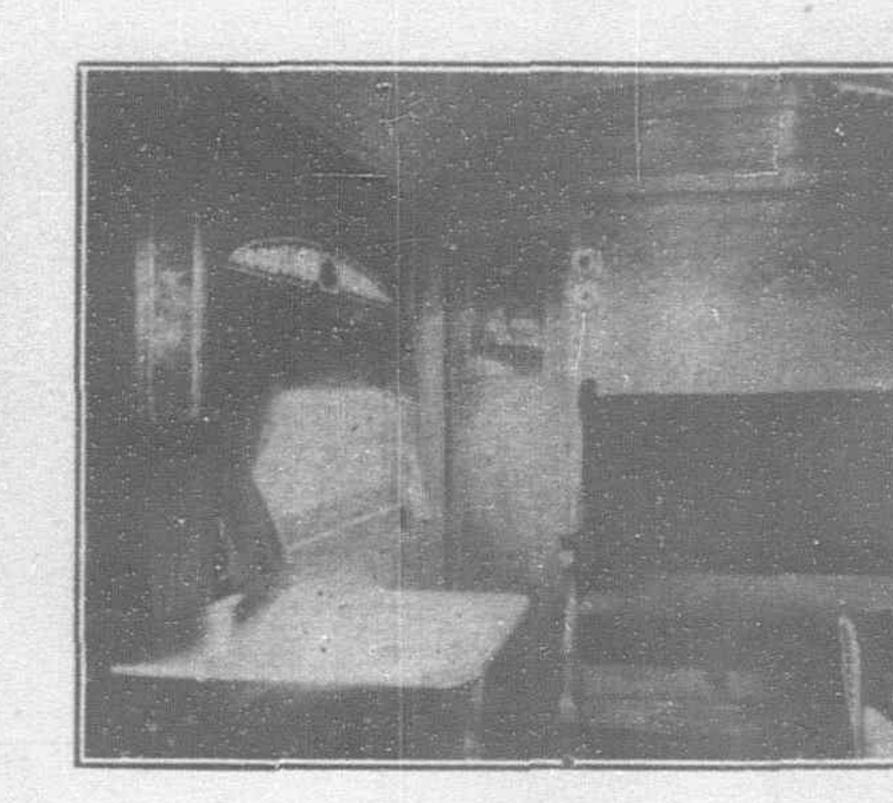
Observation Platform

Dining Room

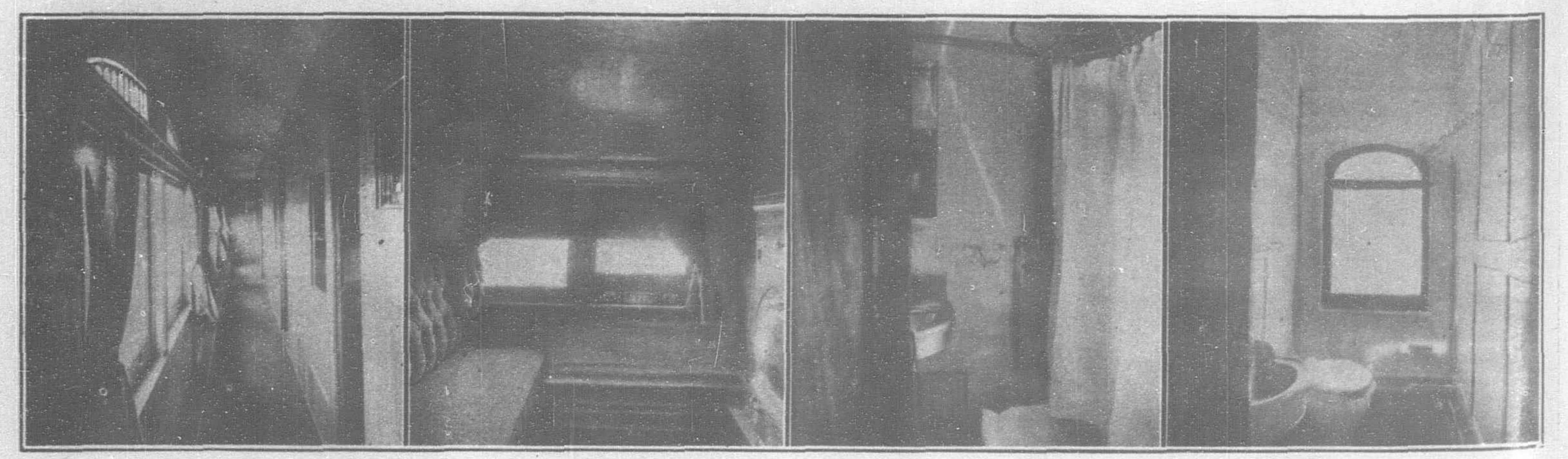
Bed Room



Observation Room



Bed Room

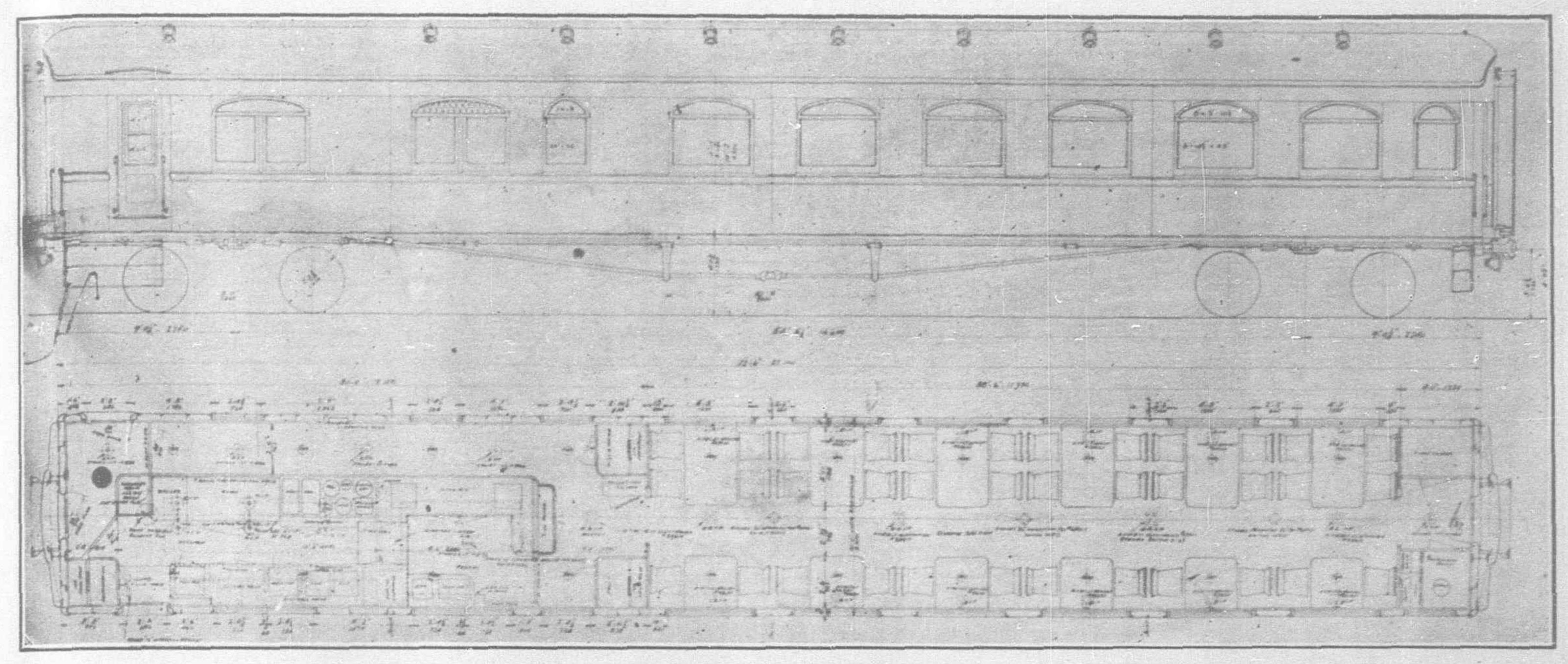


Corridor

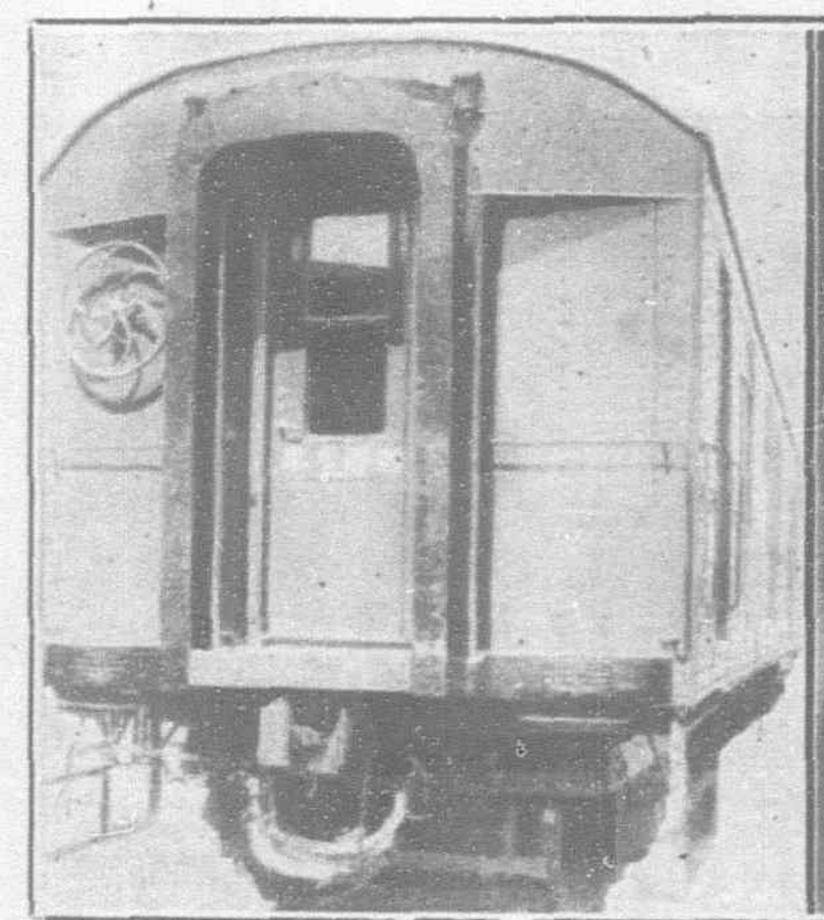
Bed Room

Shower Bath

Toilet and Lavatory



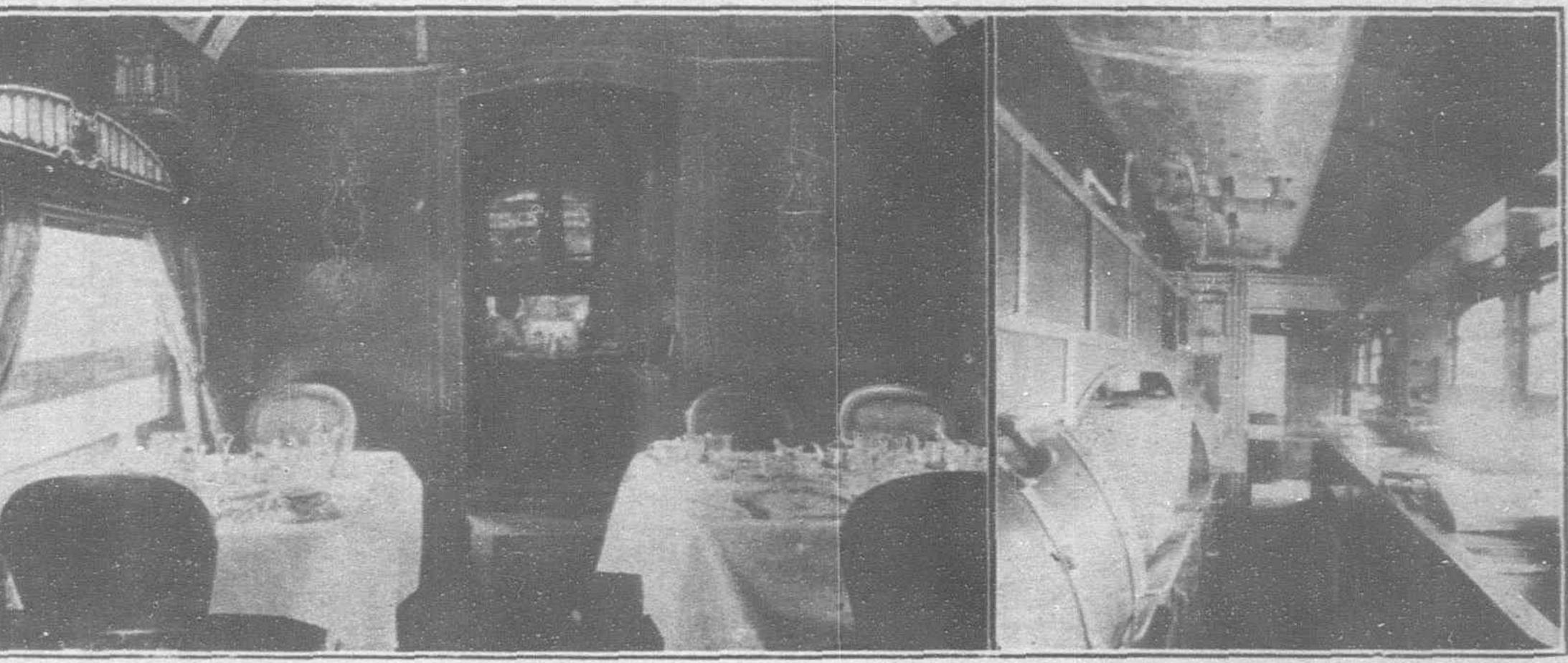
General Floor Plan of Dining Car



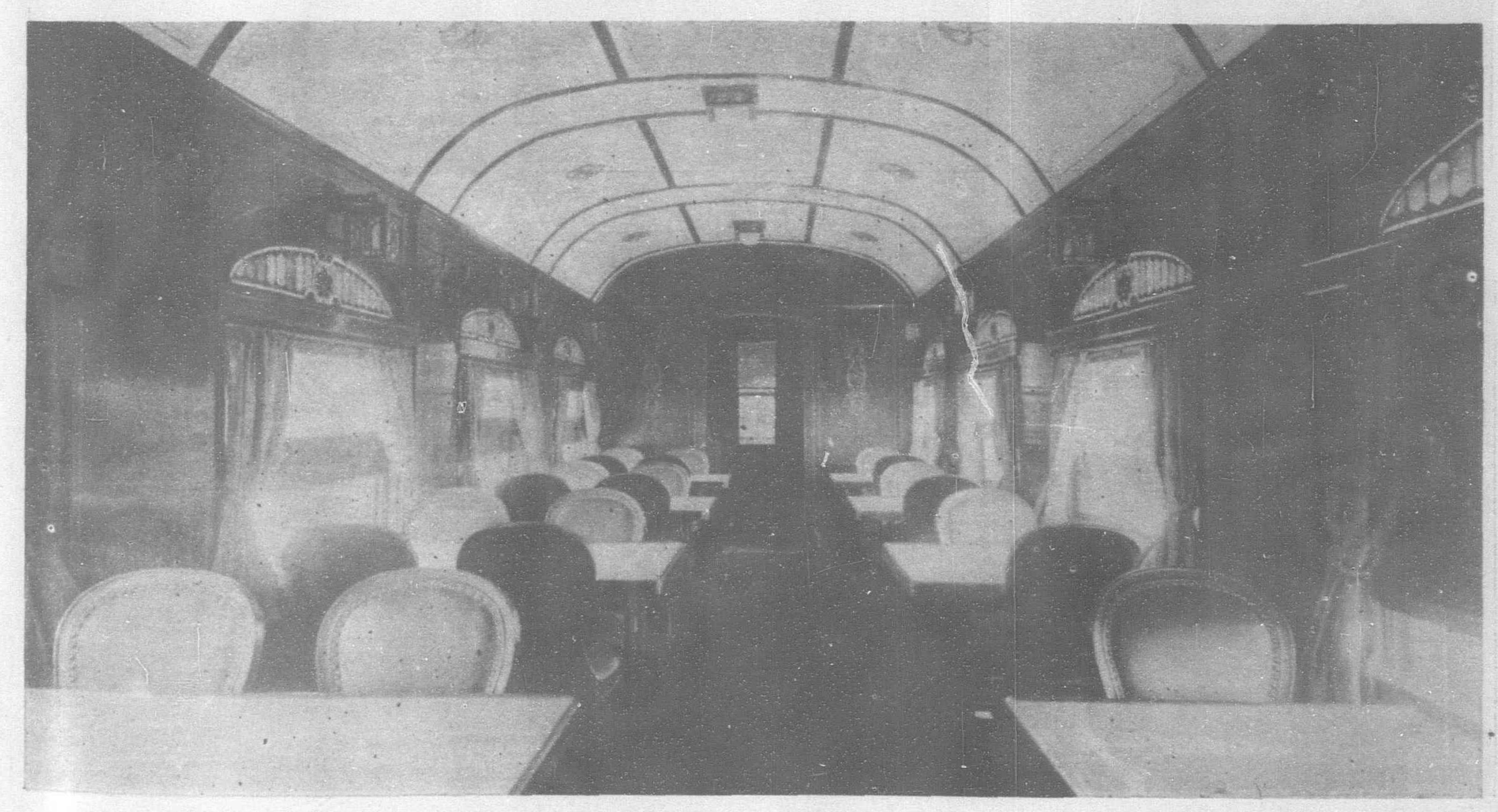
End View



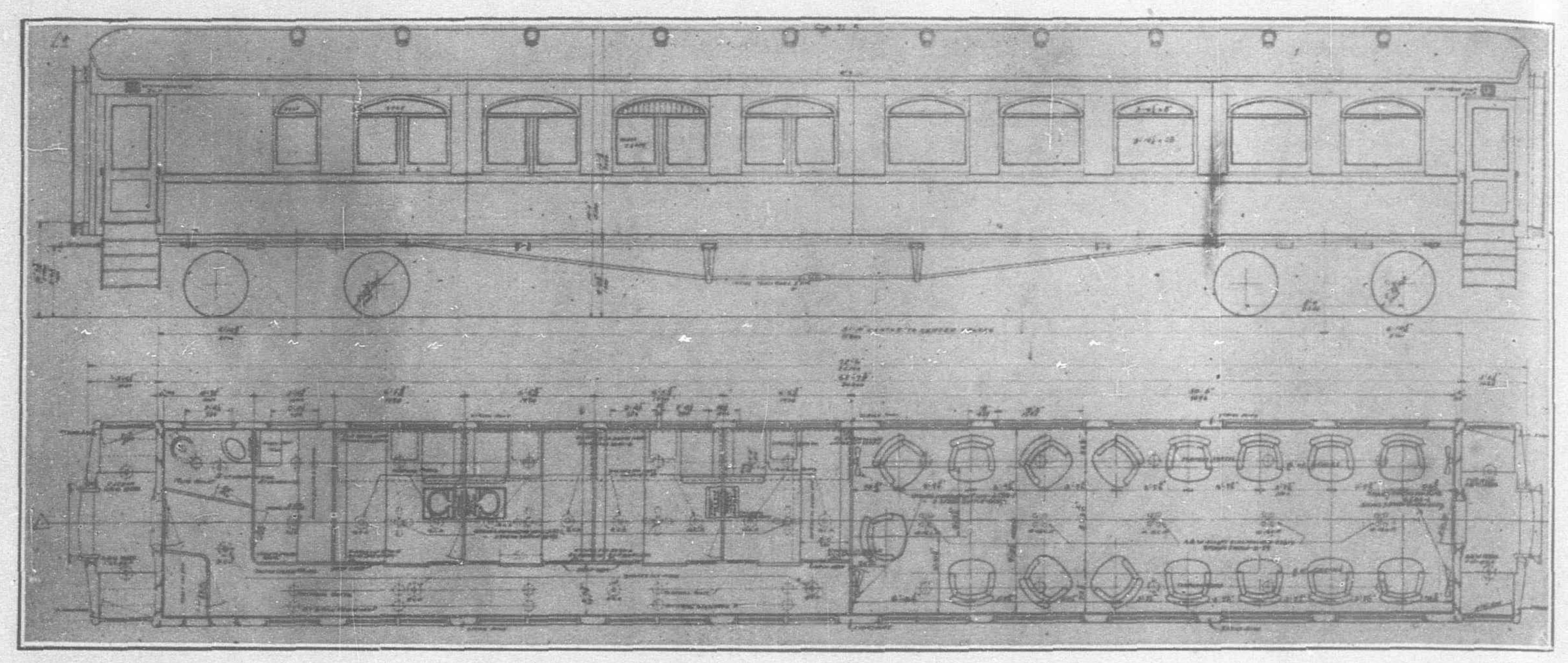
First Class Dining Car: Showing Side Board



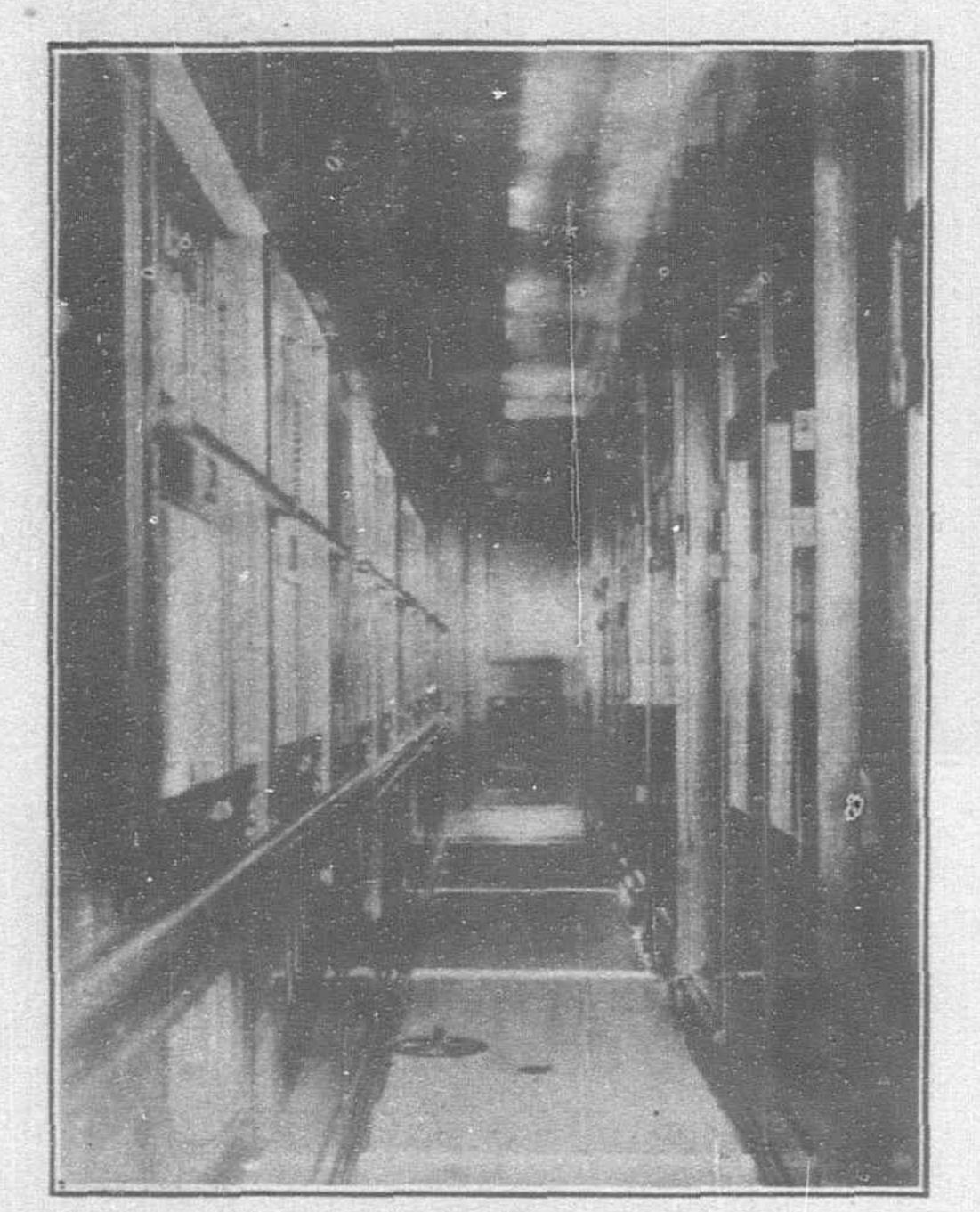
Kitchen



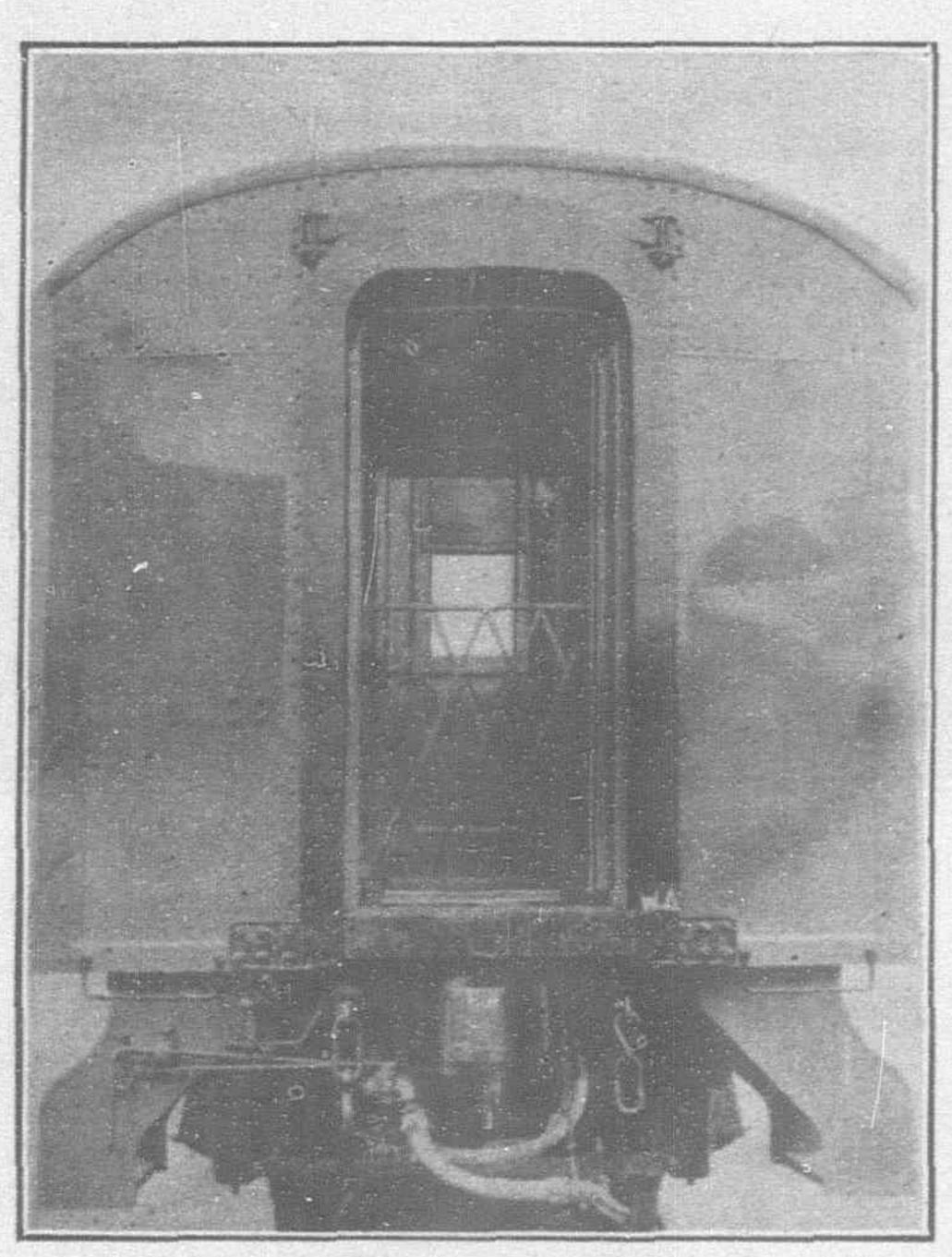
Interior of Dining Car



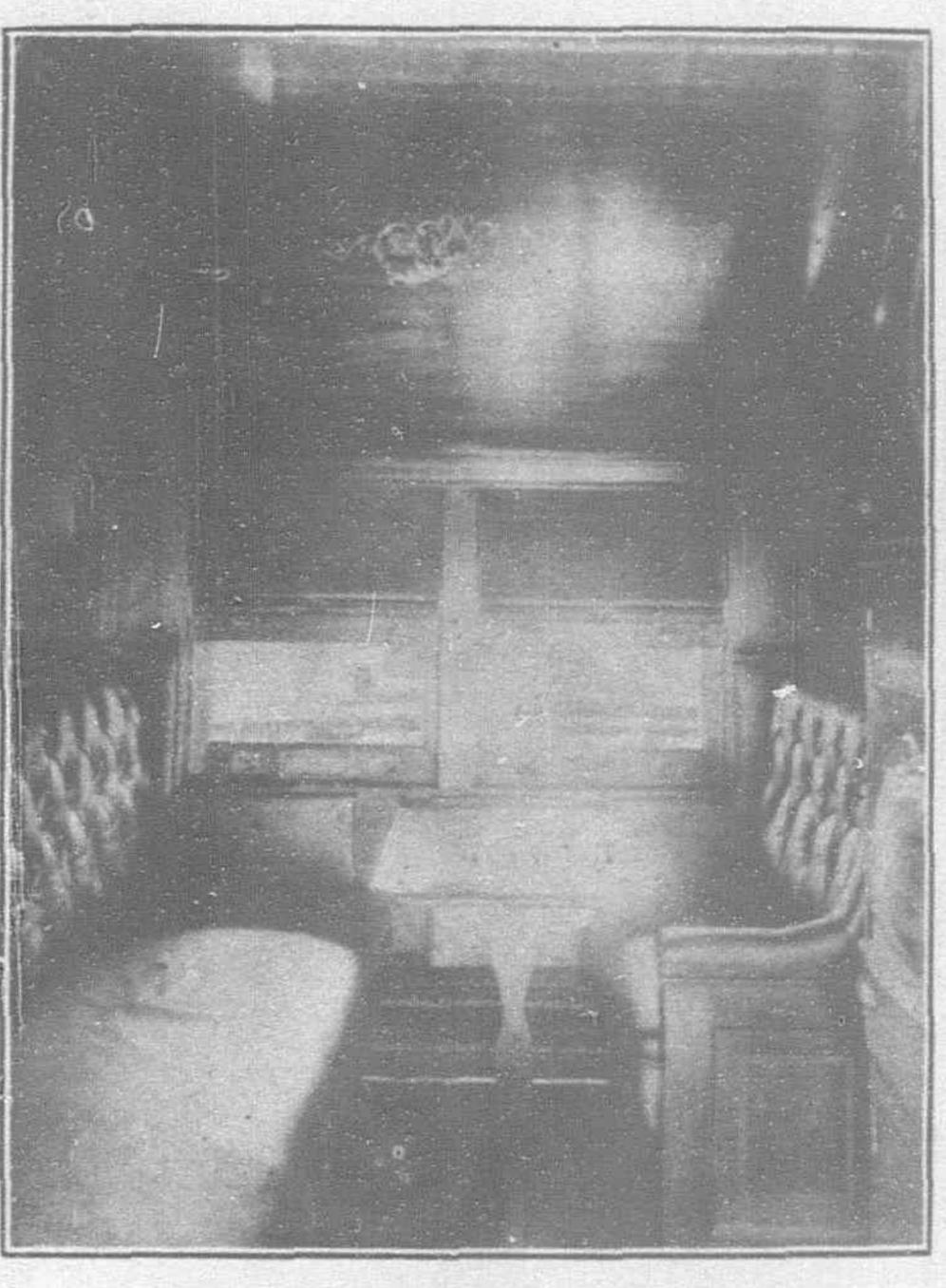
General Floor Plan of First Class Sleeping and Drawing Room Car



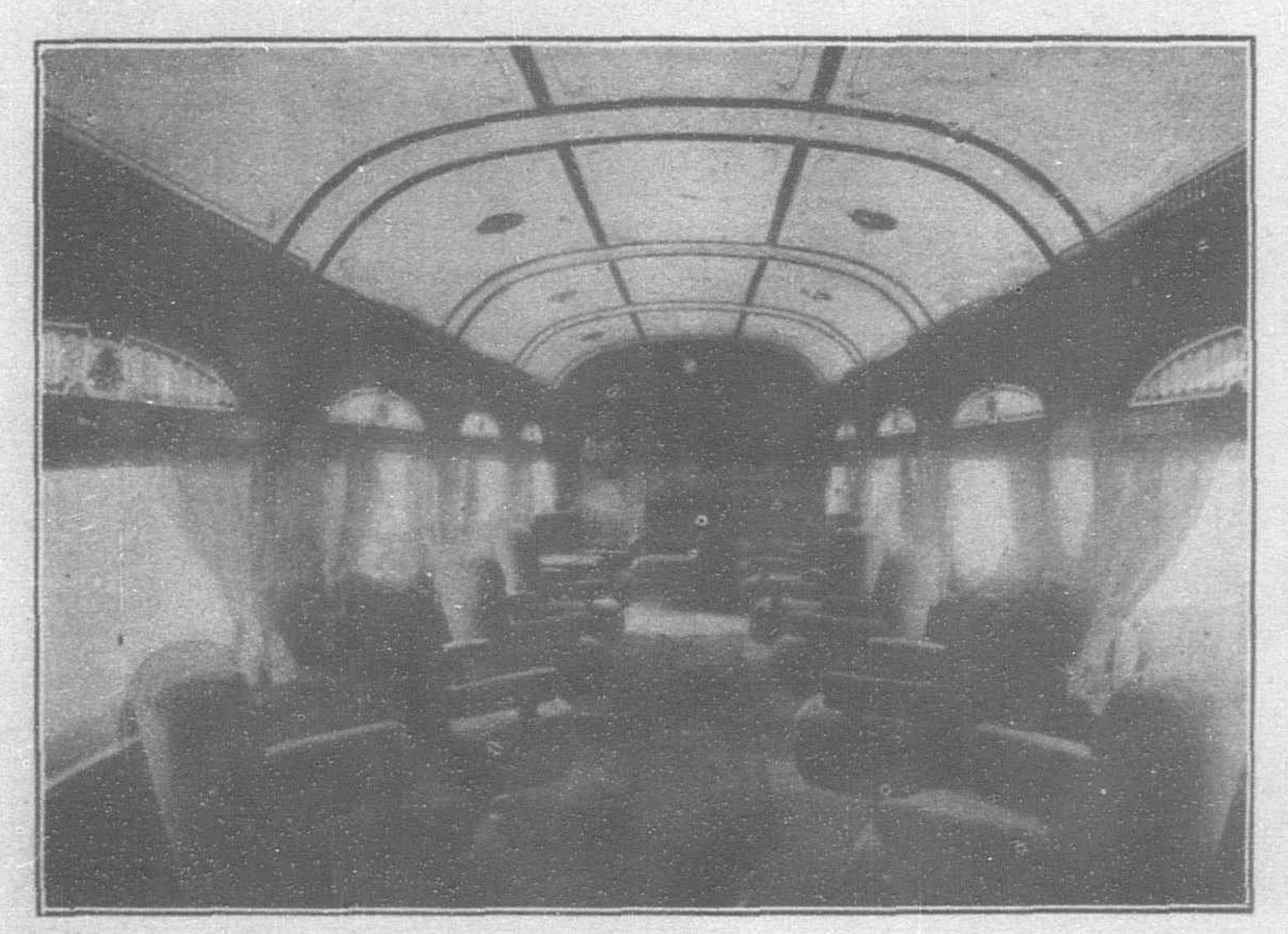
Corridor



End View

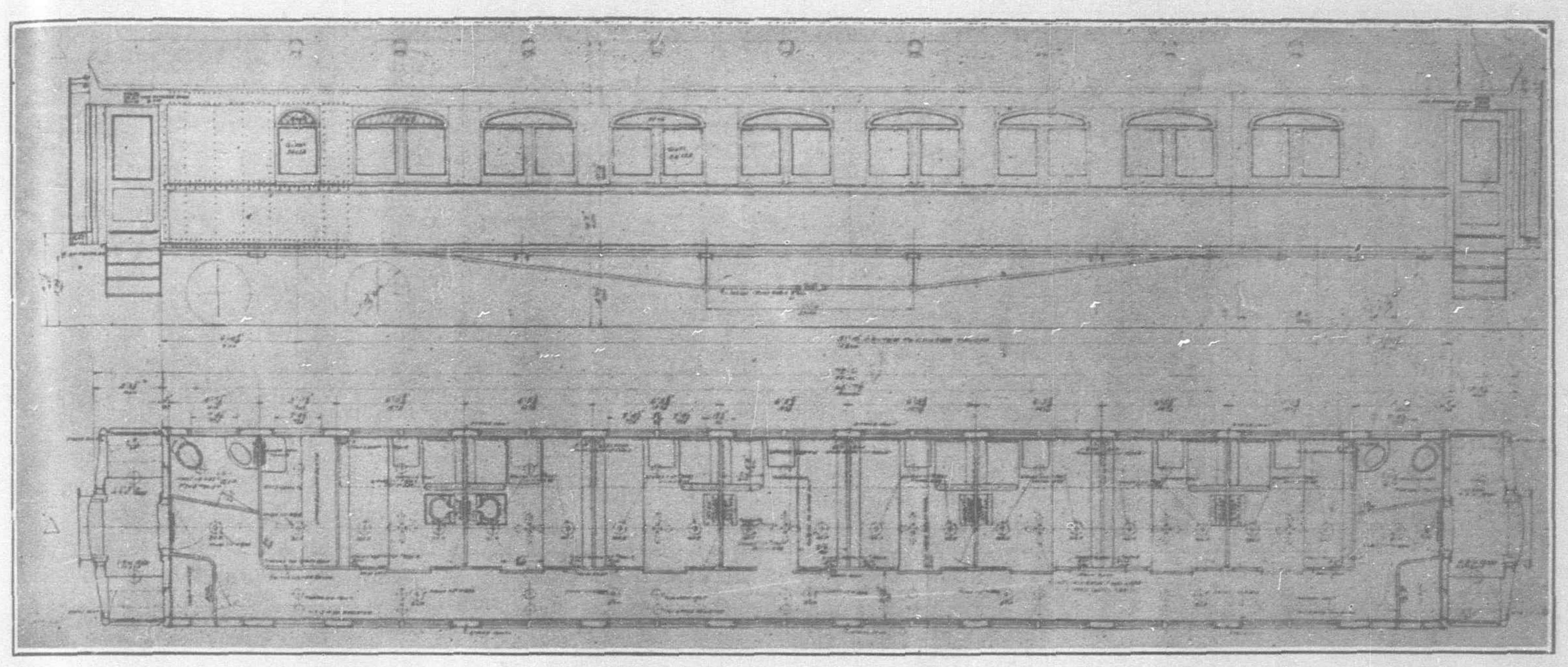


Compartment: showing Pullman Type Upper Berth

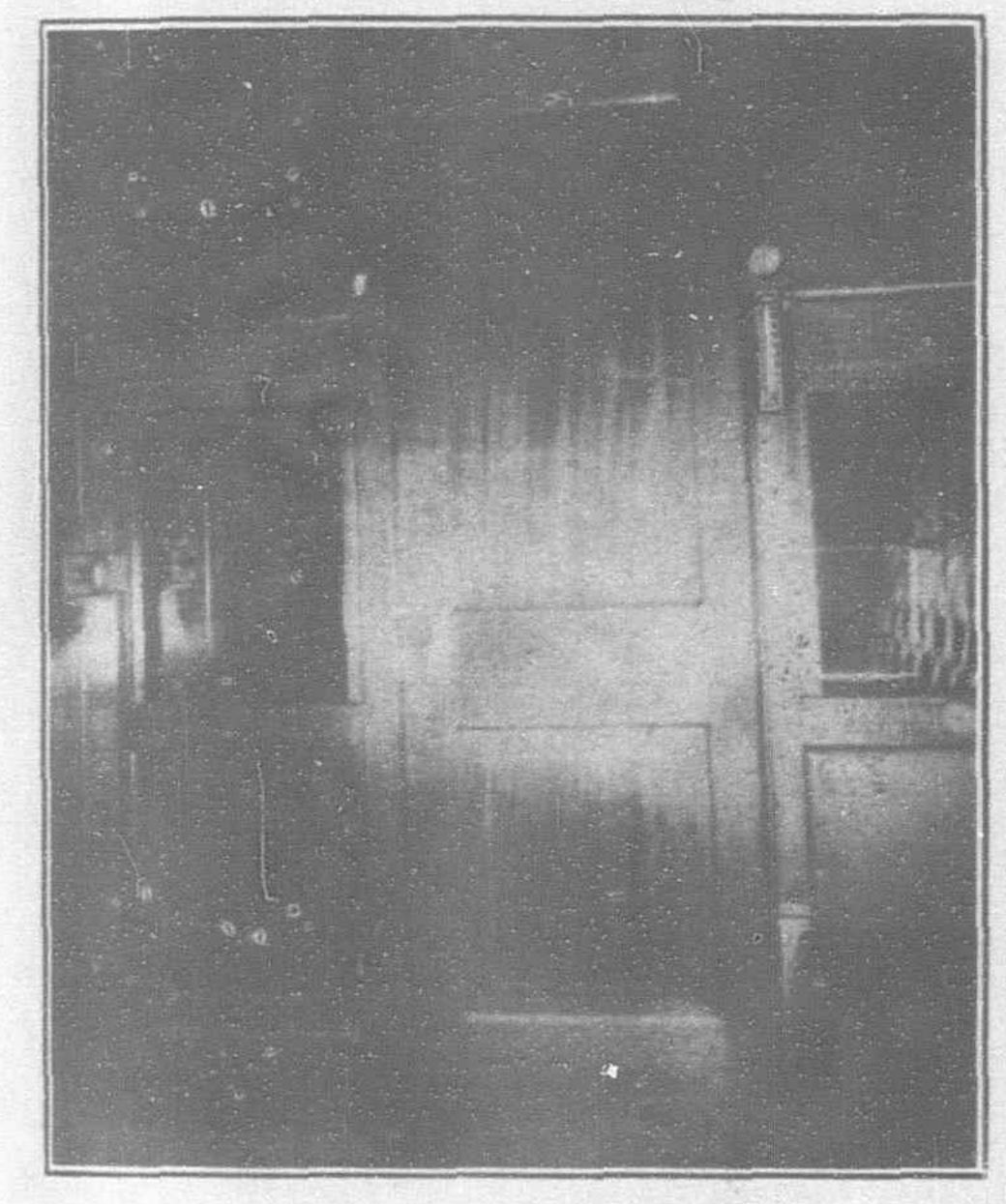




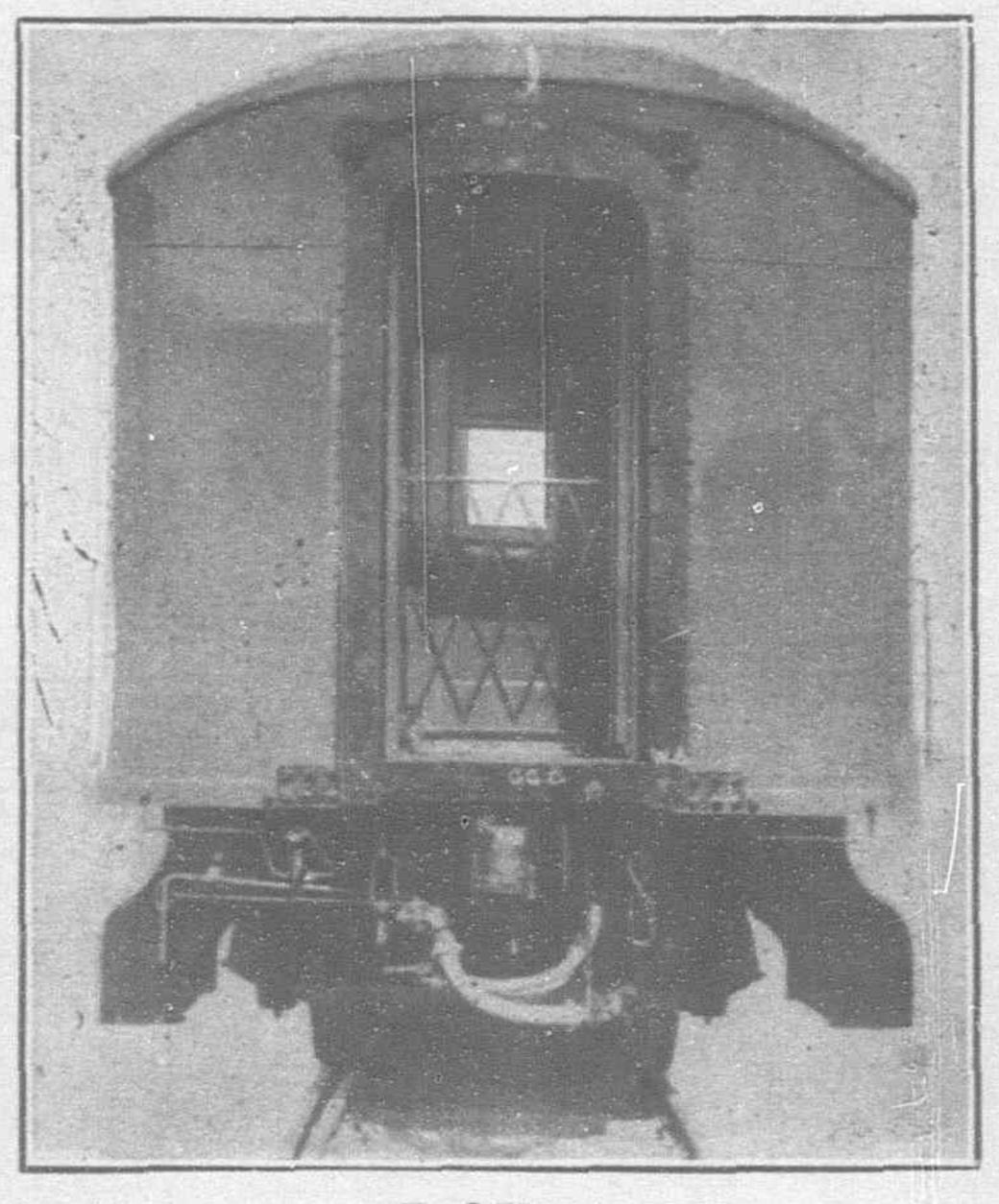
Interior of Drawing or Observation Room



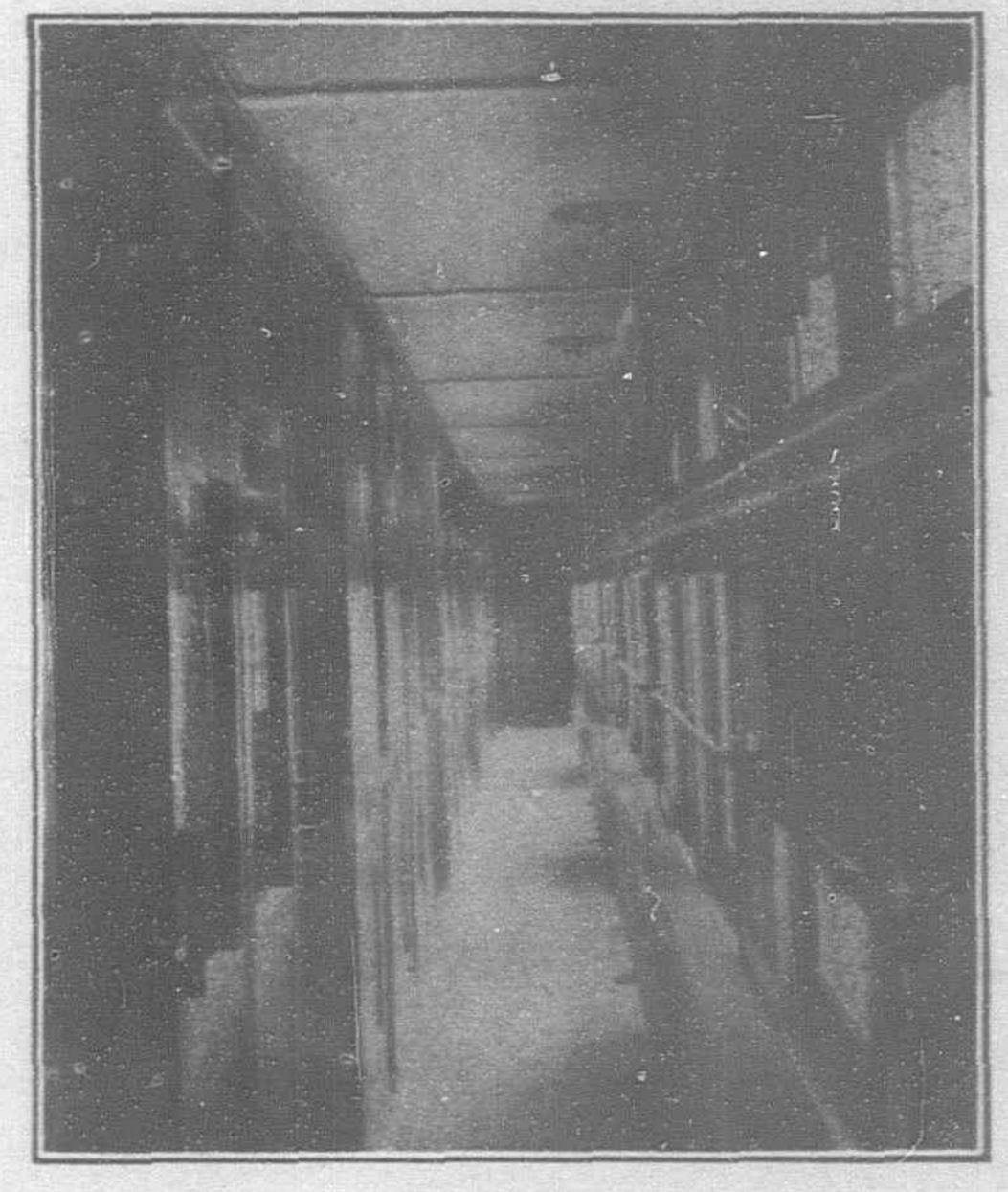
Plan and Elevation of First Class Sleeping Car



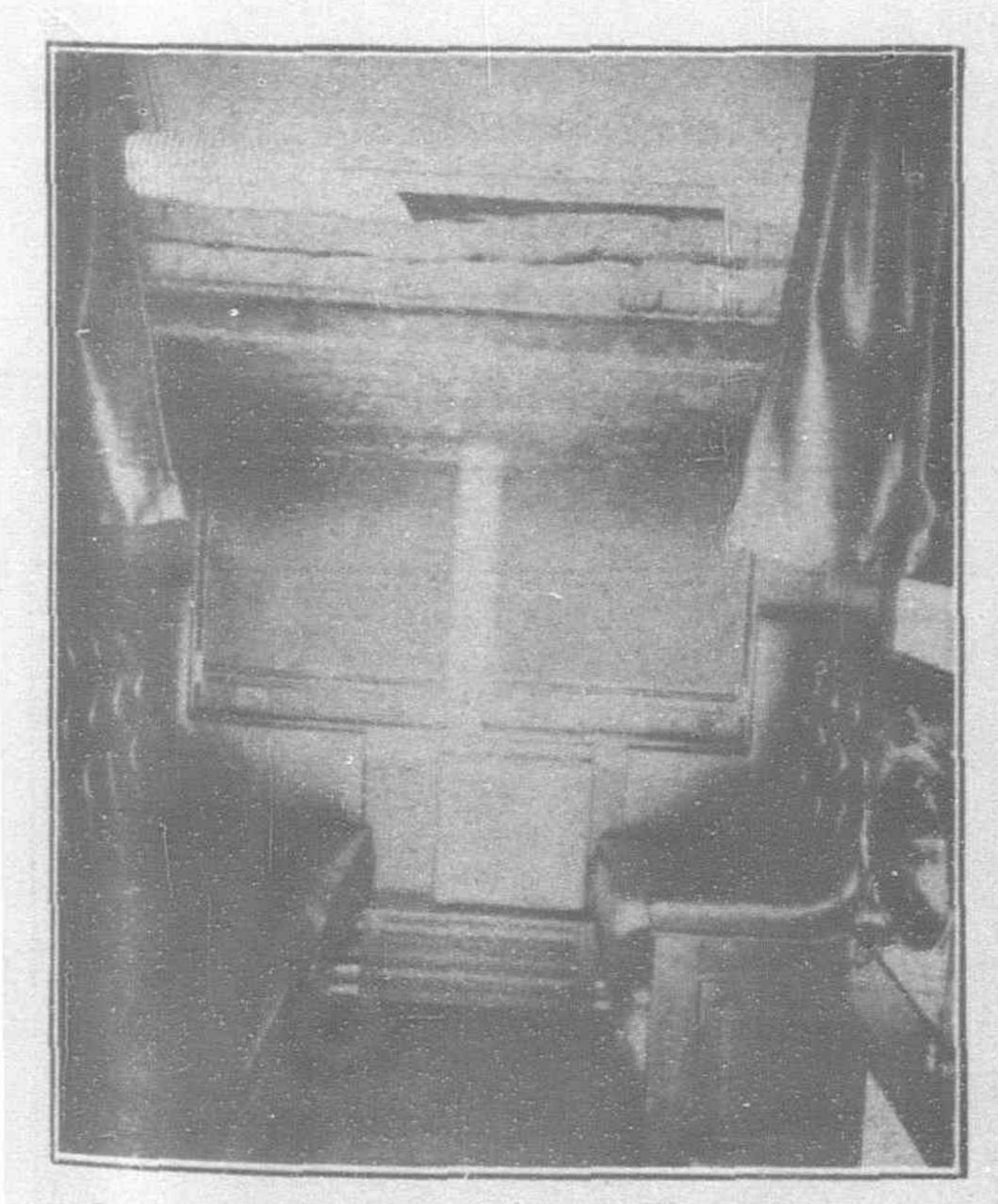
Interior of Sleeping Compartment Showing Door



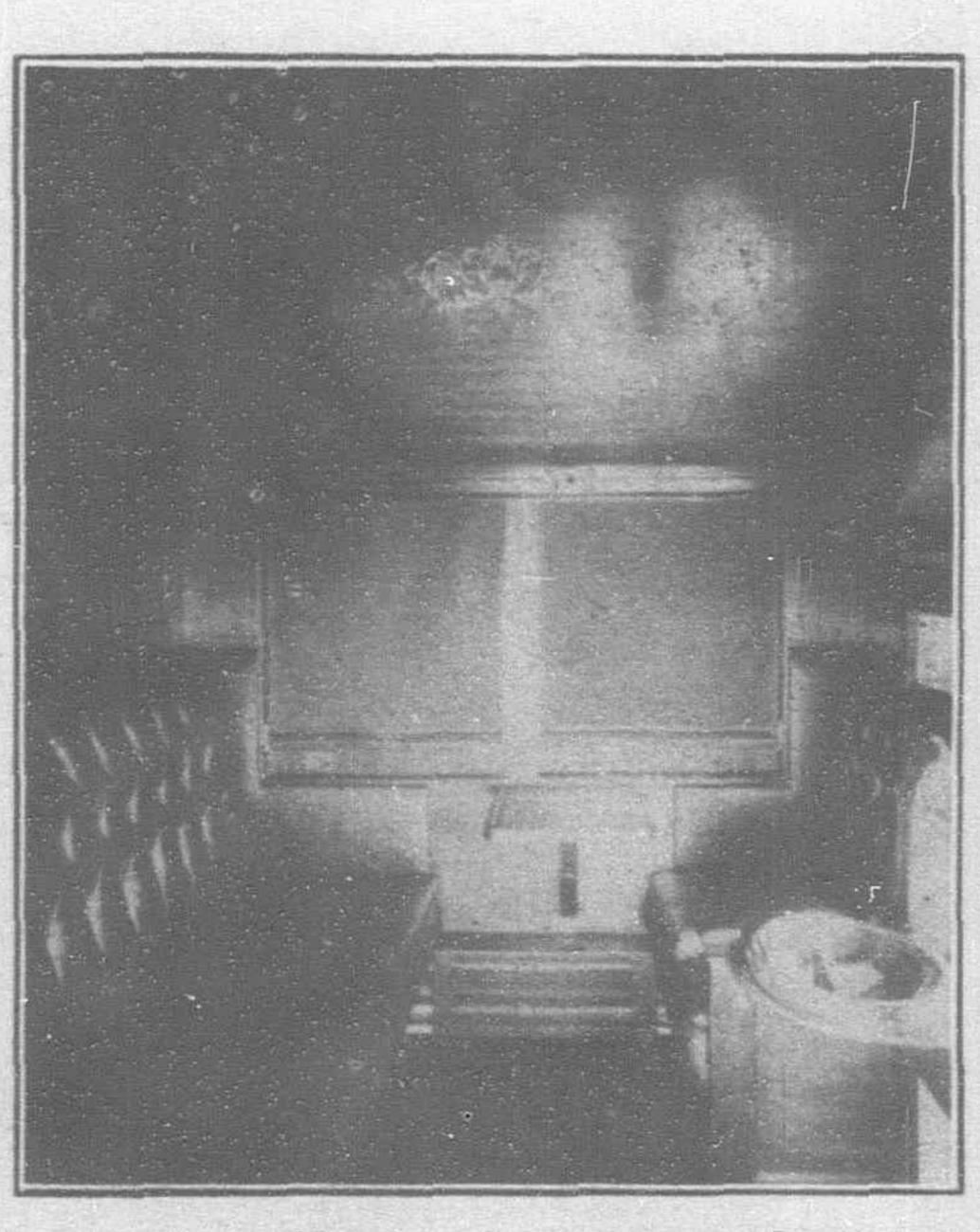
End View



Corridor



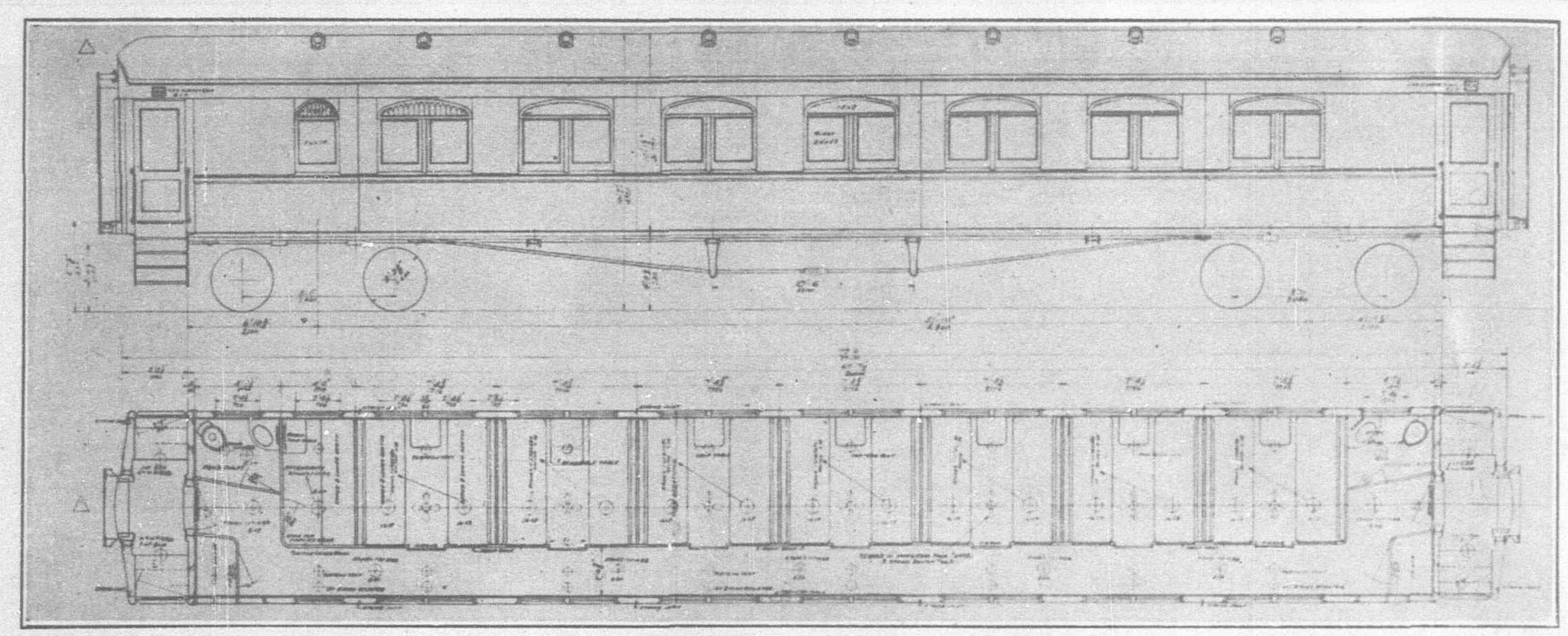
Interior of Sleeping Compartment Showing Upper Berth Open; Washstand Closed



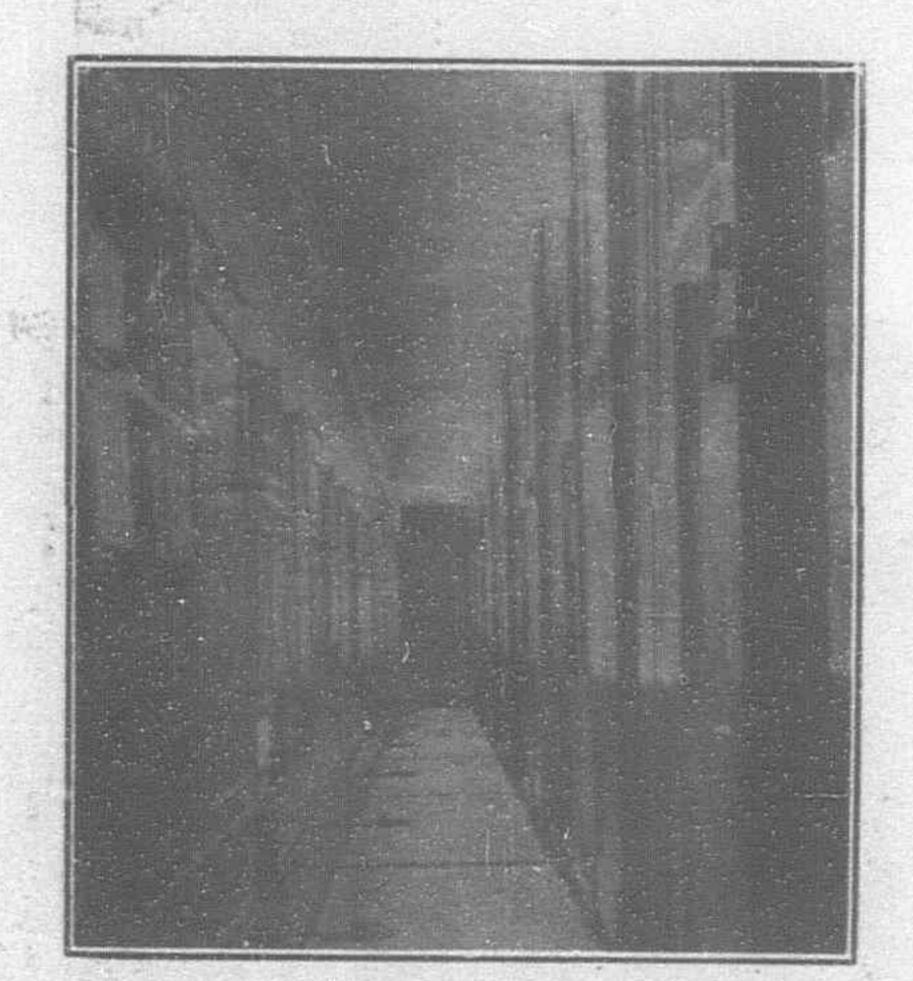
Interior of Sleeping Compartment showing Upper Berth Closed and Washstand Open



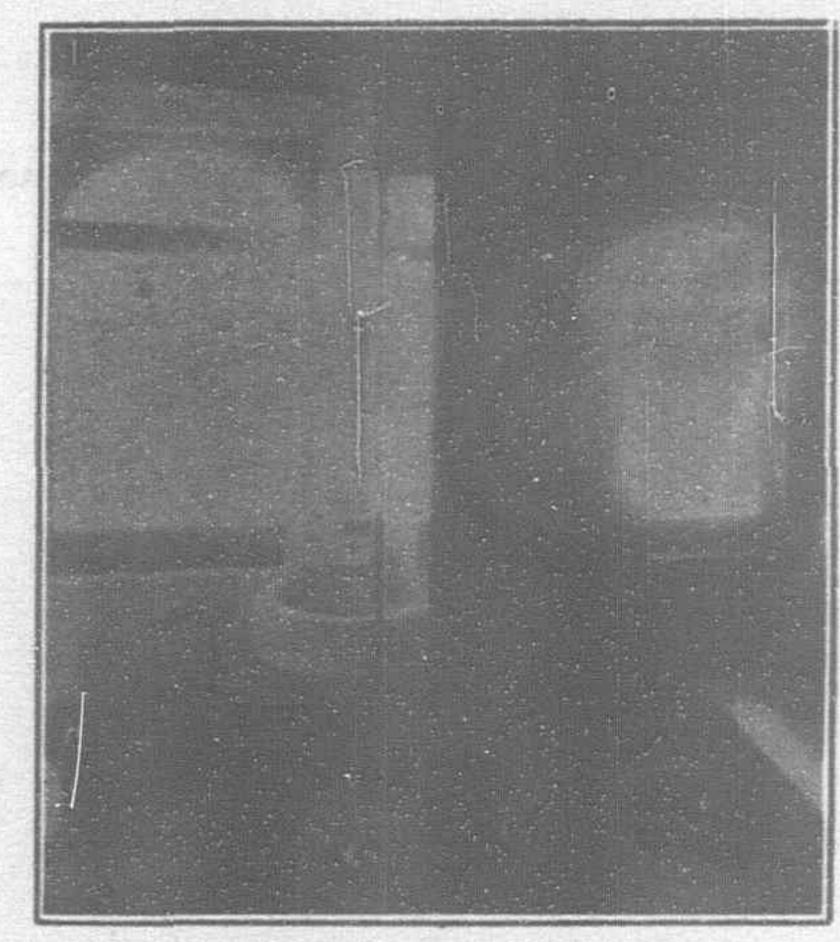
Lavatory and Toilet; Attendant's Room



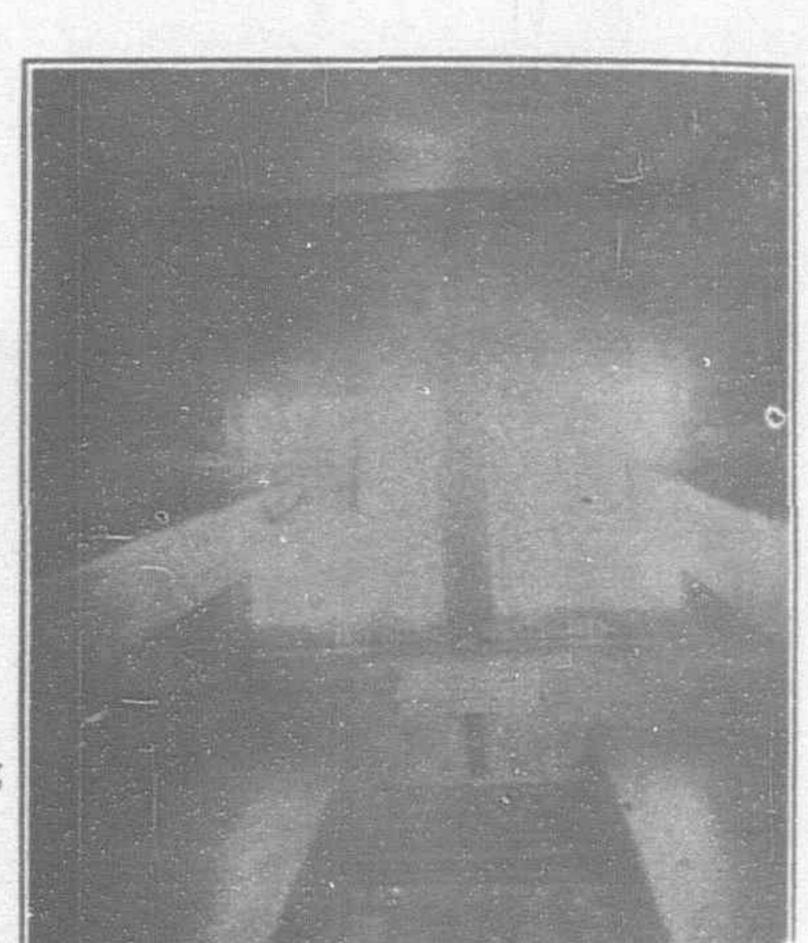
Plan and Elevation of Second Class Sleeping Car



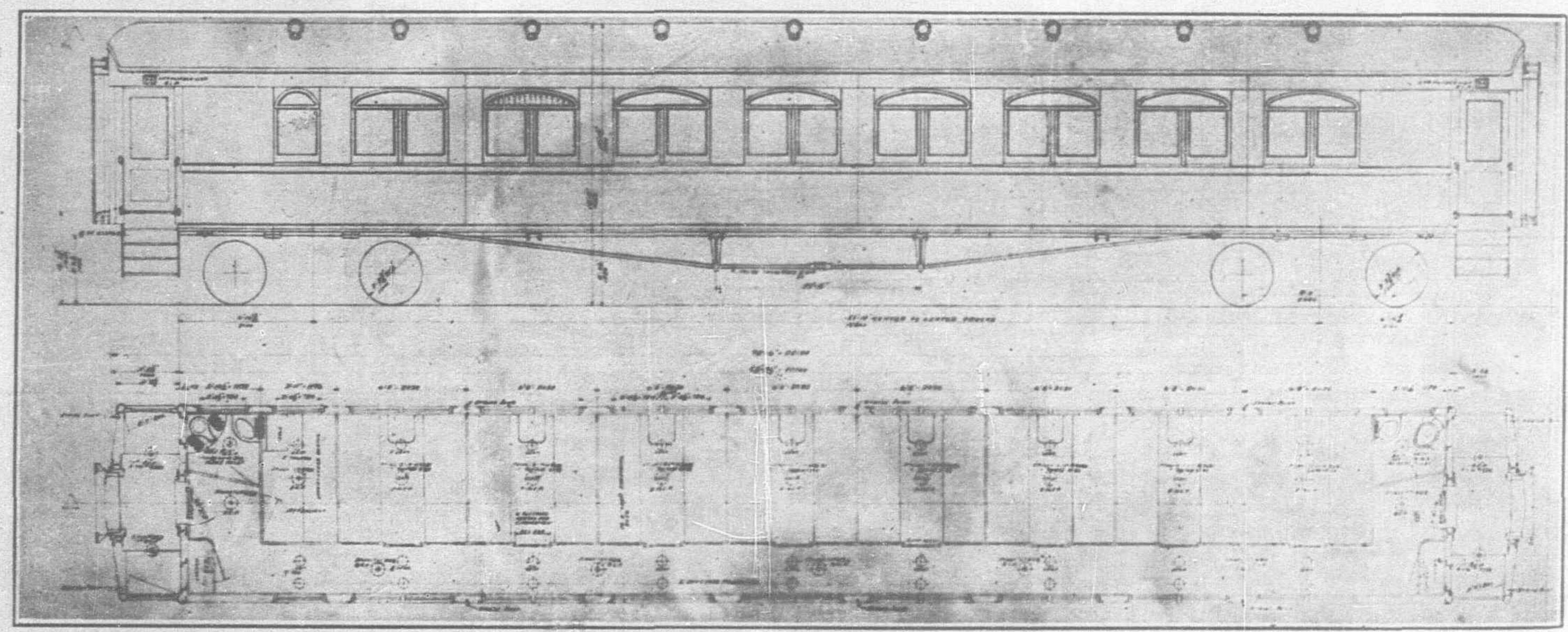
Corridor



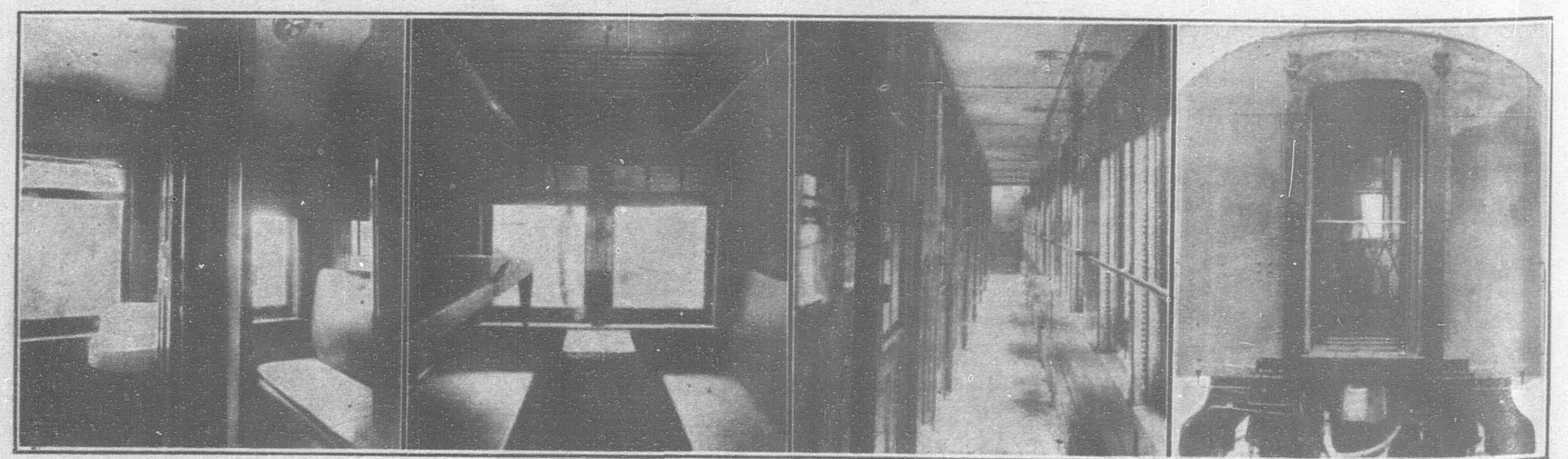
Lavatory and Guard Room



Interior Sleeping Compartment



Plan and Elevation of Third Class Sleeping Car



Lavatory and Guard Room

3rd Class Sleeping Compartment: 6 Berths each

Corridor

End View

various types of cars. The belt rail is a 4-in. by ½-in. bevelled edge bar. The side plate is a 3-in. by 3-in. by ½-in. angle. The side sheets, end sheets and letter board are ½-in. levelled steel.

The end construction for the vestibuled cars consists of four vertical 6-in. "H" beams, 23.8-lbs. at each end, one located each side of body end door and at each side of passageway opening at end of vestibule. At the body end between the door and corner there are two vertical 4-in. "Z" bars. The dummy or stub end cars, namely, baggage cars, postal cars and dining cars, have a vertical 12-in eye beam, 311-lbs. each side of the end door and two vertical 4-in. "Z" bars between the door and each corner of car. The end construction is unusually heavy and strong when compared with other cars in China, due to making this feature conform with American practice of following the United States railway mail service requirements, stipulating a minimum section modulus of 65 for the vertical end members at each end of car, of which those members adjacent to the doors are to have 75 per cent. of this amount. Special attention is drawn to the strong end construction which is intended to withstand impacts from wrecks and collisions, eliminate possibility of telescoping and restrict the damage to the ends of cars, so as to reduce personal injuries to a minimum.

The roof is of \(\frac{3}{4}\)-in. tongue and grooved wood covered with canvas to conform with latest tendenies of passenger car construction.

The floor construction consists of a 1-in. copper bearing steel sub floor, over which is a 1-in. dead air space, followed by another course of sheet steel on which rests a layer of \(\frac{3}{4} \)-in. hair felt insulation. Above the insulation is a course of \(1\frac{1}{8} \)-in. tongue and grooved wood supporting a \(\frac{3}{4} \)-in. thickness of Monolith composition cement secured with wire netting. The sides and ends are insulated with \(\frac{3}{4} \)-in. Salamander, secured by means of wire nails are welded to the sheets.

Interior Finish

The interior finish for the first class sleeping cars, dining cars, drawing room cars and one of the private cars is red mahogany with neat inlay lines and artistic marquetry inlay designs. The finish for the other two private cars is white mahogany. The finish for second-class sleepers is quartered oak; for the third-class sleepers pitch pine and steel for the baggage cars and postal cars.

The floors for all first-class cars are covered with high-grade Wilton carpets, the halls, toilets and vestibule floors being covered with red and green square rubber tile. The floors of second-class sleeping cars are covered with brown linoleum.

The upholstery for first-class coupés and dining cars is brown Spanish leather; for the drawing room green short nap figured plush, and fabricoid for the second- and third-class sleeping cars. Ceilings are white with ornamentation for the first-class cars. The windows in dining cars, drawing room cars and private cars are fitted with draperies of sun fast figured material.

General Features

The ventilation is the exhaust type by means of torpedo roof ventilators drawing from a continuous space from end to end of car between the roof and ceiling. The ventilation is regulated by "Hit and Miss" type of registers located in the ceiling and arranged so the various coupés or sections of the cars are regulated independently. In addition, air intake ventilators are provided at the bottom of the windows in first- and second-class cars.

The heating is the "Gold" vapor system with independent control for the coupés of first- and second-class sleeping cars. With the vapor system, the steam from locomotive is regulated by an automatic device so that there is no pressure in the pipes inside of car.

All steel used in the cars and bogies, as well as axles and wheels was supplied by the United States Steel Corporation.

The exterior of the cars is royal blue with gold ornamentation and lettering in English and Chinese. At the centre of car there is a

coat of arms specially designed for these trains consisting of a wreath of Chinese wheat, surrounding a shield containing the five colors of the Chinese flag with the yellow bridge as representing one of the important engineering structures on the system. There is also included the winged wheel representing progress, and the initials T.P.R. in English and the characters for Tsin-Pu.

The lighting equipment is the Stone 24-volt system with Tonum batteries. All materials for the lighting were supplied by the Stone Co., with the exception of the lamps in the dining room, drawing room and principal rooms in private cars, which were designed and manufactured in America so as to harmonize with the general in terior scheme of these rooms.

The table equipment for the dining cars and private cars was supplied by the builder and include Hotel Ambassador design of forks, knives and spoons, the remaining silverware being one of the latest designs of the International Silver Co. The chinaware is Lamberton style. The table covers and napkins are of Irish linen. Glassware, silverware, china and linen are marked with the Railway Company's monogram. The table equipment supplied is in excess of present requirements and will suffice should a la carte service be inaugurated at a later period.

Air brakes are the Westinghouse with two shoes acting on each wheel.

The various sleeping cars and drawing room cars have an illuminated car number sign over the steps that can be adjusted to show numbers from 1 to 99. These cars are also fitted with illuminated toilet room designation signs so passengers on looking out of the coupés can determine which direction to proceed.

All first- and second-class cars are fitted with annunciators located in attendants' room so they can determine exactly by which push button the call was made.

Special Features

The following are special features that represent a new departure for Chinese railway passenger equipment:—

Spring actuated steel gangway connections or diaphragms between cars.

Wide vestibules and platform trap doors with easy access and egress steps covered with anti-slip treads.

Permanent sliding window screens.

Hot as well as cold running water for washbasins of first-class cars.

Large and conveniently located windows that permit of clear view while seated in a comfortable position.

Water tanks underneath of car for first-class cars and forced to faucets by air pressure system.

Brake slack adjusters for automatically maintaining a constant air brake piston travel.

Metal conduit system for wiring, permitting of replacing and repairing wires without disturbing the finish.

Safety chains between cars eliminating possibility of train separation in case of broken coupler or damaged draft gear.

Air train signal allowing of signalling the engine driver from any car in cases of emergency.

Solid rolled steel wheels.

Roller side bearings between body and bogies.

Pivotted head spring centering couplers.

Ground level filling arrangement for overhead water tanks, eliminating necessity to climb to top of cars.

General Arrangement of Cars

The first-class sleeping cars have eight coupés, each accommodating two passengers, quarters for two car attendants and two toilet rooms. In the coupés there is a sofa extending crosswise of car the full length of the coupé and which is used for the lower berth at night. On the opposite side next to the window, there is an individual seat which permits both occupants to be seated next to the

window. The upper berth is the Pullman fold-up type located above the windows and running lengthwise with the car. This type of upper berth presents a roomy coupé during the day time and is used for storage of bedding. There is a folding lavatory to each coupé and each pair of coupés is connected by a communicating door. Berth reading lamps are provided for both berths also curtain for the upper berth. A small drop down table is provided in each coupé, also sockets for the application of a larger removable table for use when card playing or dining in coupé.

The drawing room car has four coupés exactly like those for the first-class sleeping car and a room with sixteen revolving parlor car chairs in addition to quarters for two attendants and a toilet room. The windows in the drawing room are wide with art colored glass above, and this car might be styled an observation car.

The second-class sleeping cars have seven coupés, each accommodating four passengers; quarters for two car attendants and two toilet rooms. The seats are used for lower berths, the seat backs for the upper berths, the back being pivotted and held in raised position by two leather covered chains. Each coupé has a small drop table and sockets for a larger removable table.

The third-class sleeping cars have eight coupés, each accommodating six passengers, quarters for two car attendants and two toilet rooms. The uppermost berth is permanent and can be used for luggage during the day time. The seats are used for lower berths and the back for the middle berth by being swung up and supported by two hinged legs.

The dining car has a dining saloon accommodating 36 persons at one time, there being six tables on one side for four persons and six on the opposite side for two persons. The tables are removable and are covered with a milk colored glass. The chairs are loose and can be placed as close to the table as one desires. The windows are spaced central with the tables and are wide so as to give a clear view when seated at the tables. Art colored glass is provided over the windows. At one end of the dining room there is an office for the steward, with linen lockers at the opposite side. At the other end of dining car there is a buffet having a side-board and two refrigerators, one for wines and the other for fruit.

Next to the buffet is the pantry and kitchen of the latest arrangement and containing all the modern conveniences for dining cars. The pantry contains overhead lockers, sink with hot and cold water chill boxes for provisions and iced chambers for milk, etc.

The kitchen is equipped with a Stearn's range, broiler, steam table, refrigerator, chill box, overhead lockers, special containers, sinks with hot and cold water, dish and glass racks, plate warmers, coffee urns, warming ovens. The water supply is from overhead tanks which can be refilled from the air pressure water tank underneath the car. The hot water supply for sinks and steam table is from storage tanks and water backs in range. Provision is made so steam can be drawn from the locomotive as an auxilliary for quick heating steam table, also, so cold water at the sinks can be drawn direct from the air pressure tank.

The refrigerators are porcelain lined with syphons separating the provisions and meat from the ice chamber. Lights inside of refrigerator are turned off and on automatically with the operation of the door. The wine refrigerator is equipped completely with pull out type of bottle racks.

The kitchen is fitted with a large roof ventilator, also an exhaust blower. A hallway is provided at side of kitchen so that passengers pass through the car without going through the kitchen.

The baggage car has a corridor extending the full length of car. The baggage space is partitioned off in two equal sections. At one end of the car there are quarters for the train crew including a bunk room fitted with two berths and a special strong box for station revenue, which can be dropped into the receptacle, but cannot be removed except by unlocking the door. This room also contains a

fire extinguisher, stretcher and first aid outfit. At the other end of car there is a toilet room for the train crew.

The postal car has quarters for the train guard at one end, the remaining space being divided into two sections, one for parcels, the other being in accordance with and containing all the appurtenances as used in American postal cars, which permits of assorting and distribution of mail en route.

The private cars are alike except two are finished with light wood and one with dark. In addition, the latter has an additional room, fitted with brass bed instead of a library. The general arrangement of the former is as follows: The observation or sitting room contains five large wicker chairs and a sofa which can be made into two berths by swinging up the back and applying curtains. At the observation end there is a platform with brass railing and awning, folding seats being used. Next to the sitting room is a library containing a sofa that can be made into two berths, a large wicker chair, writing desk and a small chair. Accessible from hall or by communicating door at library is a bed room containing a brass bed, wardrobe and dresse: Connected with the bed room is a bath room containing a shower bath, stationary lavatory and hopper. Next to the private toilet is a general toilet room accessible from the hall containing a lavatory and hopper. Next, there is a coupé or guest room which is a duplicate of the first-class sleeping car coupé except a large wicker chair is introduced instead of the small seat.

The dining room contains a side-board, extension table, six chairs, writing desk, book case and a sofa that can be made into two berths by swinging up the back and applying curtain. The servants' quarters adjacent to the dining room have accommodations for four servants. Following this is a kitchen fitted with a Stearn's range and broiler, also sink, chill box, lockers, etc. The refrigerator for supplies is located at one side of vestibule and is the same as described for the dining car. At this end, there is a toilet room for the servants and an individual hot water heater.

The private cars are equipped with a dual heating system, that is, they may be vapor heated with steam from the locomotive when in operation or by an independent hot water system when on a siding where no steam supply is available.

The dining room is upholstered with green leather, the bed rooms and sitting room with green short nap figured plush and the servants' sections with fabricoid. The finish at kichen end of car is of oak.

Bogies

The bogies or trucks are of the four-wheel American equalizer type of structural steel construction. The wheels are metre diameter of solid rolled steel one piece type. The axles are open hearth steel with 5½-in. by 10-in. journals. The journal or bearing boxes are of cast steel with top hinged spring closing lids. Side bearings are the Stucki roller type. Brake beams are of the trussed type with removable shoes. The trucks are alike for all of the cars except for a slight difference in the springs to compensate for the difference in weight of the various types of cars.

With a trip of the duration of the one from Peking to Pukow it is obvious that trains should be made as comfortable as possible. As many important Chinese as well as foreign visitors and leading foreign business men make this trip, it is just as necessary that the cars should be made safe. It is hoped that the Chinese railway officials and those employed on the cars will take care of the splendid equipment under their care. This remains to be seen, but from the handling of the trains during the past fortnight, it appears that they are going to deteriorate rapidly and prove that they are in advance of what the car attendants might be expected to keep in proper order, unless we have enthusiastic hopes that the Chinese might in time adopt themselves to the modern equipment, keep them in clean and proper condition and handle the various features so the traveling public might benefit by what has been inaugurated for their comfort.

For a Greater Tokyo

Dr. Beard Submits His Report on Plans for Consolidation

F all the large capitals of the world, none is in greater need of municipal improvements than Tokyo. The worst streets, miserable transportation system, lack of sewage or sewage disposal facilities, overcrowded houses and business districts, disease breeding slums, inadequate parks and breathing places for the public, all conduce to conditions which make life anything but pleasant and piles up the death rate. Although great improvements have been planned and are being carried out as far as the finances of the municipality will permit, rapid progress is impossible owing to many complex conditions arising from conflicts of authority, jurisdiction and other causes having their origins firmly imbedded in old traditions and imperial prerogatives all of which combine to deprive

the municipal government of initiative and the power to raise adequate taxation to carry out its functions.

In order to find a solution to these problems, Baron Goto, the mayor of Tokyo, some time ago invited Dr. Beard, the well-known municipal American expert, to come to Tokyo and make a most searching investigation into conditions and report without bias on the problems that must be faced in order to consolidate the municipal authority and make possible the crying reforms. After some months of careful study, Dr. Beard has completed the task and submitted his report, the main features of which are here given.



Viscount Goto, Mayor of Tokyo, and Dr. Charles A. Beard, Municipal Expert

The first requirement for the efficient administration of Greater Tokyo is the consolidation of the metropolitan area under one powerful city government. The function of supplying gas, electricity, transportation, water, and sewerage, as well as the successful administration of health, charitable, and other services, calls for unitary treatment to prevent duplication and waste. As long as the city does not control the growth of the suburban areas, it cannot prevent congestion in the environs or relieve it at the centre. While the city does not control the suburbs it cannot compel those who use its streets, transact business in its offices, wear out its pavement and enjoy its benefits to pay their just share of the cost of city government. Without consolidation there can be no genuine city planning in Tokyo. The experience of London, Paris, Berlin, and New York prove this. The city authorities of Tokyo know this and have prepared careful plans for consolidation. The whole matter is in the hands of the imperial government.

Special emphasis should be laid upon creating powerful municipal government within the area of Greater Tokyo. At the present time the power of government is divided among many agencies, including the city government, the police commissioner, the prefect,

and certain ministers of the imperial government. Responsibility for the welfare and prosperity of Tokyo is nowhere fixed. There are many conflicts of authority. Duplication of work and overlapping of functions appear throughout the city. There are long and costly delays due to the absence of responsibility. Therefore there should be one powerful government within Greater Tokyo, subject only to the direct and limited supervision of imperial authorities. If such a city government cannot be created soon, then it would be better for the imperial government to follow the example of France and the United States; that is, abolish the semblance of self-government for the capital and vest the entire administration in imperial officers similar in power to the prefect of the Seine or the commissioners of the district of Columbta.

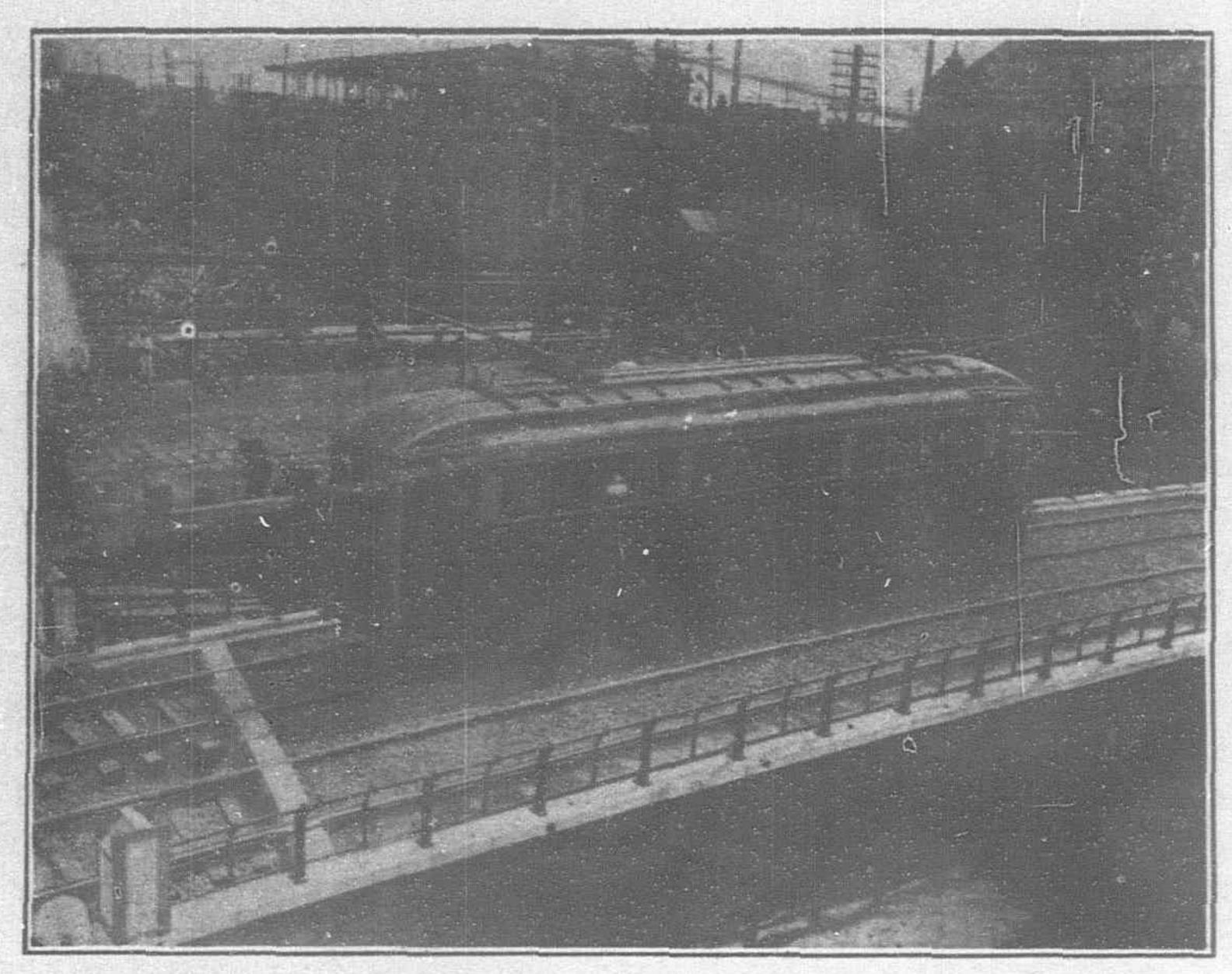
Budget System Good

The budget system of Tokyo, in most respects, conforms to the highest standards established by the New York bureau of municipal research for testing the excellence of budget methods. Some details might well be perfected, but on the whole most American cities could consider themselves fortunate in possessing a budget system comparable to that now in operation in Tokyo.

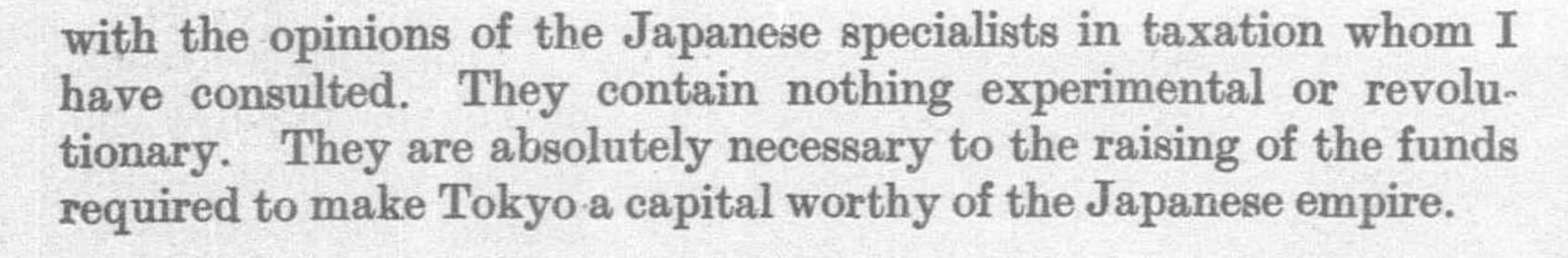
As regards the municipal debt of Tokyo, it must be said that the city is in a sound financial condition. The net debt of Tokyo for non-revenue producing purposes

(that is, excluding such bonds as waterworks and street railway securities) is only Y.26,000,000 in round numbers, or about one per cent. of the estimated value of the real estate of the city. According to American standards, which are conservative, the detb of Tokyo for non-revenue producing purposes would not be excessive if it were ten times its present size.

From every standpoint the system of taxation now prevailing in Tokyo deserves condemnation. The city has no general and independent taxing power. It must rely mainly on surtaxes imposed on imperial and prefectural taxes. At present almost the entire burden falls on business enterprise, income and consumption. Land almost entirely escapes, for it pays only about one million yen a year into the city treasury. Buildings are lightly taxed. Instead of this system I recommend the following: (a) a new and scientific assessment of all real estate; (b) the placing of the main burden of taxation on real estate; (c) the application of the special assessment to all kinds of public works which confer a direct benefit upon land owners; (d) the granting of an independent taxing power to the city within certain general limits; and (e) the simplification of the tax system. These recommendations are in accord



Elevated and Street Railway in Tokyo

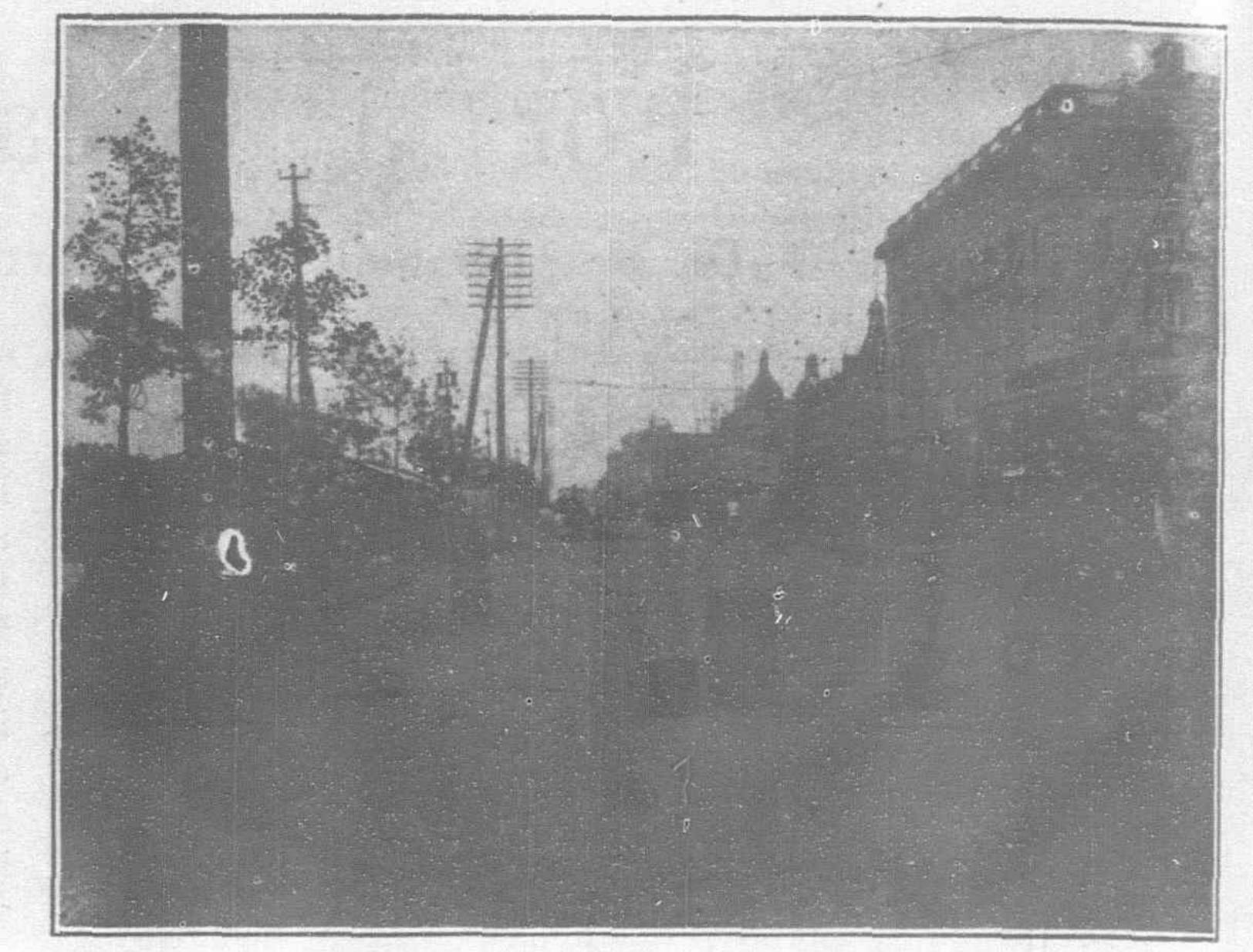


Government Taxation

The imperial government and the imperial household do not make contributions to the treasury of Tokyo commensurate with the amount of tax exempt land and property which they hold within the city. Justice to Tokyo requires the imperial government to make subventions at least equal in amount to such special assessments as would be laid upon imperial property in case it were taxed like other property. Probably the following would be the best solution of the vexatious problem of subventions: let the imperial government and the imperial household make contributions toward meeting the capital outlays and current expenditures of Tokyo on the same basis as other land owners under a scientific system of assessment and taxation for benefits conferred. Such contribution, like a real property tax, are also necessary to the modernization of the capital of Japan.

The city administration is to be commended for taking certain steps toward the centralization of the purchase of supplies. A great deal remains to be done, however, in the way of establishing standard specifications and improving purchasing methods. I therefore suggest that you make a careful survey of the local problems in the light of Western experience in purchasing.

In the employment of civil servants. I find in Tokyo few of



Paving one of the Main Streets of Tokyo

the gross evils which have long plagued American cities—evils which have been partially remedied by civil service reform. However, I venture to call your attention to the importance of this problem and the desirability of making a special study of the subject.

The construction of the new waterworks extensions proceeds rapidly and by the summer of 1924 Tokyo will have the mains laid and will be prepared to supply at least 45 gallons per capita to all the inhabitants of the present city. This is about the average consumption of the smaller European cities, but is considerably lower than that of the leading European and American cities. The new requirements created by the completion of the sewer system, street cleaning, and fire protection will compel the city to take immediate thought about further extensions of the supply.

One large section of the city is now supplied with sewerage and a new disposal, plant is in operation at Mikawashima. In a section of the city the sewer pipes are being laid. Plans have been made for the remainder of the city. The completion of the system waits on financial resources and I urgently recommend the extension of the principle of special assessments to sewer construction. I also suggest the purchase and use of improved labor-saving machinery for making excavations, driving piles, and making refills. This would greatly expedite the work and reduce the cost. The money and labor saved by this process could be used to good advantage in making slum clearages and building new municipal dwelling.

In the field of public untilities I find a state of great confusion. The city government has no control over the granting of charters



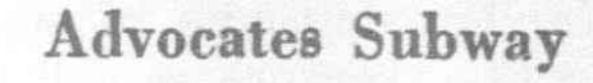
Mitsukoshi Department Store, Tokyo



The Tokyo Kaikan (Assembly Hall), Tokyoll

to electric light, gas, subway, bus, and other utility companies. It can, by special contract, make certain regulations as to prices and sevices. The regulations which have been made up to the present time do not adequately protect the public interest, and I therefore thoroughgoing scientific survey this field. This would involve on examination into the latest western methods. of establishing specifications and controlling utility companies. A

careful study should be made of the so-called "model franchises" of the United States and also the rise, growth, and limitations of regulation by state and municipal commissions.



As to transportation, your colleagues in the city government are well aware of the deplorable congestion which now exists and they believe with me that subways offer the only solution. It is unfortunate that the imperial railways department has chartered four subway companies without reference to the plans of the city or the problems of government involved in the creation of a Greater Tokyo. At present, however, they are all at a standstill on account of their inability to secure the capital with which to build subways. Meantime the city having a small sum of Y.7,000,000, now proposes to construct a short experimental line about two miles in length to relieve congestion at certain points. The plans of the city officers are now in a formative stage and I am not prepared to offer any suggestions with reference to them. Nevertheless I urge a reconsideration of the whole problem of transportation with the idea of forming a partnership between the city and one or more companies. In some respects the situation in Tokyo is analogus to that in New York thirty years ago. The city government does not have enough money to build a complete system of subways and private capital hesitates to assume the entire risk. In New York

when conditions were similar a partnership between the city and private capital was formed and the subways were built. The experiment has been in many ways unfortunate, but the citizens have been supplied with a remarkable service. the principle of special assessments were applied to subway construction, the city could readily secure a large part of the money with which to meet its share of the expenditure involved. Before any such plan is adopted, however, a careful study should be made of the



Nihonbashi Street, the extension of Ginza Street, Tokyo's Main Thoroughfare and Business

rangement.

Pavement Problem

successes and failures of

the New York city ar-

It is not necessary to say that the problem of road improvements in Tokyo is both pressing and perplexing. The climate and soil of the city present many difficulties, especially to the builder of wooden block pavements, and the number of steelshod animals and steeltired wagons make difficulties for the builder of concrete pave-

ments. These points I have discussed at some length in my report, but here I summarize my important conclusions.

The construction of pavements should follow, not precede sewer construction. Obviously it would entail great waste to lay expensive pavements and then tear them up within a year or two for sewers. Second, I strongly urge the employment of foreign highway contractors during the next few years to work side by side with the engineers engaged in pavement construction. My suggestion on this point is that the city engineers should prepare careful specifications and that experienced foreign construction companies be engaged under iron-clad contracts to construct certain wooden block, stone, concrete, and asphalt pavement and to maintain them in good condition for a period of not less than ten years. I respectfully suggest a study of the experience of Paris. Up until about 1882 every wooden brick pavement built in Paris by local engineers was a failure. In that year the city employed a British construction company under a carefully drawn contract which bound the company to build and to maintain for a period of years the pavements of certain important streets. Later the British Company was united with a French concern, but the work went forward under British control. Result: French engineers learned the technique of pavement construction and then took over the work themselves. To-day French highway engineers are among the first in the world. Tokyo may well profit from this example. Unfortunately American city authorities and engi-

> neers refused to follow the precedent set by Paris, and American taxpayers had to pay dearly for the costly experiments which were made by their city governments.

> In the field of social welfare, the city of Tokyo has been making rapid strides since 1921. Employment exchanges, model tenements and dwellings for working people, day nurseries, a municipal lodging house, an Elberfeld system of district com: mittees, and many other features of social service indicate intelligence in planning and zeal in



Ginza Street, the Main Artery of Tokyo. The large steel structure on the right is the framework for the new "Ginza Office Building."

execution. Much remains to be done, however, and nothing stands in the way of the realization of an enlightened social policy in Tokyo except a lack of funds. There is a pressing need for more parks, for playgrounds for children, and for the reservation of park and playground space in the rapidly growing suburban districts over which the city at present has no control. Honjo-ku which has a death rate of 26.55 per thousand —the highest in the city—has no large parks or playgrounds. The park and playground problem is now being studied by the Research Section of the city government and should receive the attention which its importance merits.

The city administration is well aware of the extent and nature of congestion in Tokyo, but it is also well aware that the problem of congestion cannot be successfully attacked except in connection with an efficient system of transportation, the regulation of more consideration. During the present transition period, the

housing conditions, and control over the areas around the city which are becoming congested. Moreover large financial resources are required for clearing slum areas.

Public Health Service

The advance in the public health service of Tokyo during the past ten years has not been marked by the rapid progress which characterizes the science of medicine in general. The death rate of Tokyo—that barometer of public health was 23 per thousand in 1922. The death rate in New York in 1919 was 12.39 per thousand; the death rate in Liverpool in 1920 was 16.4 per thousand. It will thus be seen that Tokyo has not yet caught up with some of the most efficiently managed cities of the western world in the protection of health. That is not all. The death rate in Tokyo shows a tendency upward rather than downward during the past ten years.

The reasons for this state of affairs involve technical questions of the highest order which can only be answered by specialists in public health after a thoroughgoing inquiry. However attention should be called to the remarkable division of responsibility for public health administration in

Tokyo. The police commissioner, the prefectural government, the city administration, and the ward governments all have important duties in connection with public health. There is great duplication of effort; there is overlapping among the functions of these four governmental agencies; there is an absence of centralized control. From the point of view of administrative science, the system or tlack of system for the protection of the people

against disease must be strongly condemned. The chaos in adminis. trative organization, however, cannot be remedied by the city government; nothing short of imperial legislation can effect the consolidation which is necessary to establish the public health service of Tokyo on a sound basis.

As to the scientific methods employed by the various health agencies now operating within Tokyo, only a complete survey by specialists in public health could produce the data for judgment. It is a matter of gratification to be able to announce that the in. stitute for municipal research is now initiating such a survey.

Aesthetic Aspect

The aesthetic aspects of city planning in Tokyo should receive

beautiful architecture of old Japan is being destroyed or submerged by all kinds of foreign designs. In every part of the city there appear many architectural monstrosities of foreign origin. Some of these are public buildings and monuments; many of them are private. This is to be profoundly regretted by those who believe that the city may be beautiful as well as equipped by the conveniences of modern civilization. I venture to call your attention therefore to the work of special civic art commissions in western cities and to suggest the creation of some such commission in Tokyo. Naturally it should represent both municipal and imperial interests.

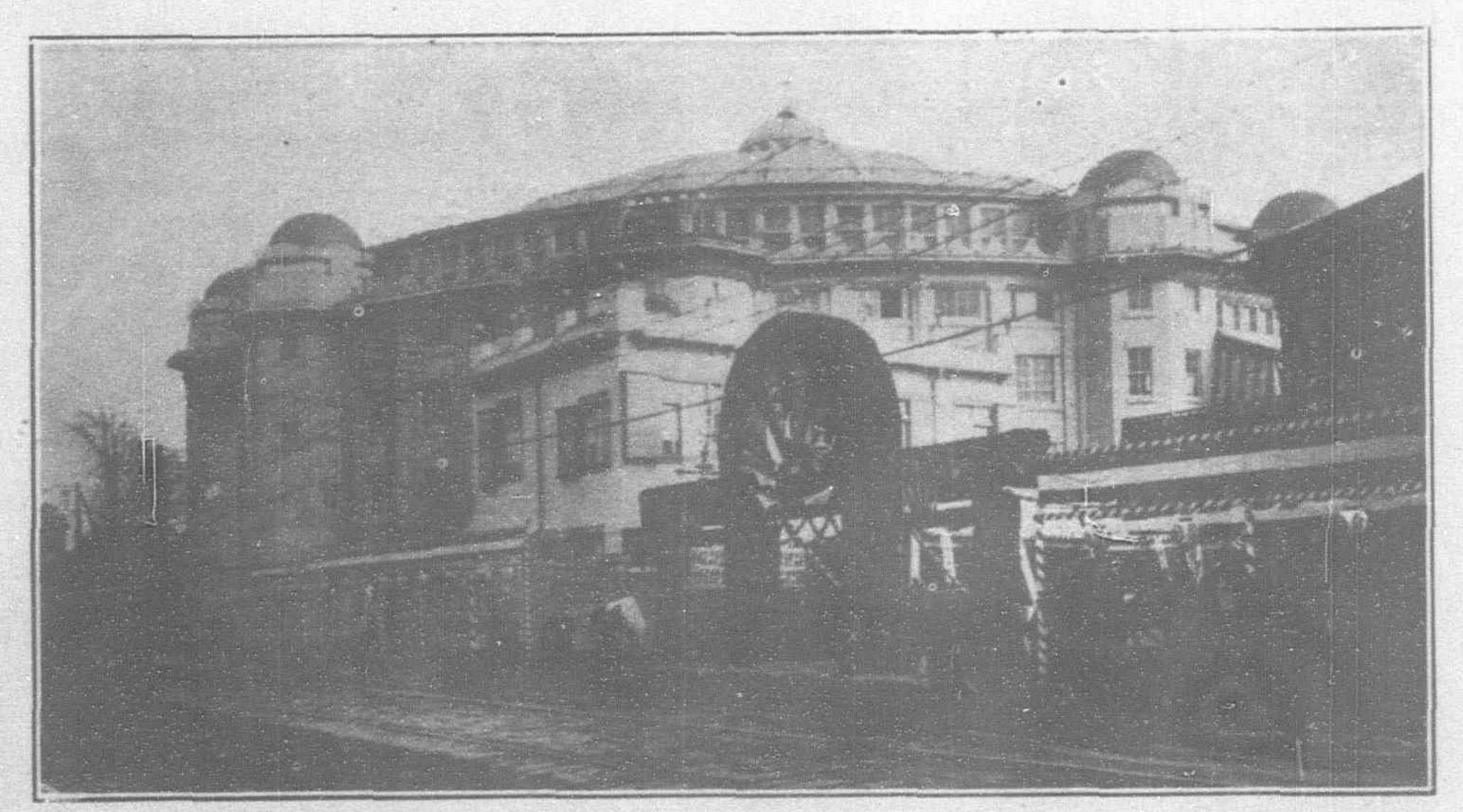
There is an apparently minor matter which deserves considerations; that is, the modern naming of streets and the proper numbering of buildings. The present system, besides being a standing nuisance, is exceedingly costly in time and money. Every day thousands of houses are wasted by pedestrians, motor car drivers, and deliverymen in hunting for streets and houses. It appears, however, that this is another matter over which the city government has no power. The present anarchy in

naming streets and numbering houses (lots) is founded upon an imperial ordinance and cannot be changed without action on the part of the imperial government.

The cities and towns of Japan are growing rapidly and nearly all of their problem are common problems. I therefore suggest the establishment of a Japanese municipal improvement association composed of



The First Mutual Life Insurance Building, one of the Newest Office Buildings on the Ginza



The New Kokugikan (Wrestling Hall) at Tokyo. A Magnificent New Steel Structure to House the National Sport

(Continued on page 277)

Pulp and Paper Manufacture

With a Short History of the Development of the Pulp Industry in Northern Japan

By Alfred Avall, Pulp and Paper Expert

HE pulp and paper industry is one of the most important and largest in the world. Pulp and paper are used not only for newspaper and books, for writing and wrapping paper, but also for insulation, pipes, twine, yarn, and box making, as well as for cloth, etc. The raw material consists mainly of various woods, but high grades of paper are manufactured from rags, fibres and grasses. Bamboo is also becoming an important raw material.

Pulp is manufactured by mechanical or chemical process. Chemical pulp may be made either by the sulphite or sulphate and soda processes. Grasses and rags are usually prepared by the latter and wood by the mechanical. Wood is also employed by the various chemical processes, depending on which treatment is the most suitable for the raw material, the site of the mill, and the class of pulp and paper to be manufactured, etc. All these various points must be carefully considered when a new pulp and paper mill is to be built.

Sulphite Pulp Manufacturing Process

Sulphite pulp is usually manufactured from wood of good quality and yields a white and easily bleached pulp, suitable for printing-paper. The wood is transported from the forest to the

pulp mill timber yard, where it is stored until required. At the wood room the logs are either cut into short lengths and barked by a special machine barked in whole lengths. The logs are then cut endways in powerful machines, producing chips and chip cakes which break up into lumps which are blown into a disintegrator dividing the cakes into suitable chip pieces. From desintegrator the chips are carried to the chip screens which remove sawdust, knots and splinters, and thence by a conveyor to an elevated chip store-

Sulphile Pulp. Hill 30.000 . ous Sulphile pulp per year an Description. 000 water - basim weed room! p-gester wept Acre Popel. Bulm-winz . K'maf-ranne Serpening Geni Daying - manter ran Store for pulse B Storm & Sough plan 1 Scale 1 1000

- 20 21 42 42 45 40 40 40 40 40 40 40

age above the digesters, to facilitate their automatic filling.

The digesting liquor, a solution of bisulphite of lime and sulphurous acid Ca H₂ (SO₃), is pumped into the chip filled digester, and boiled by indirect heating and forced circulation. After being digested the pulp is emptied into large bins, where it is washed, then transferred by pulp-digger, elevator, conveyor or pump, to the screening department.

The digesting liquor is produced either from sulphur in sulphur burners or by pyrites in Wedge or Herreshof-furnaces. The sulphur gas obtained is cleansed and cooled, and then forced through the acid towers by means of a gas fan. These towers are filled with limestone over which water drips down. The acid gas is dissolved

in the lime water and the liquor or acid runs off into tanks where it acquires the desired strength by the addition of acid gas recovered from the digester.

Should the plup contain too much water when it reaches the screening department, this is removed by a pulp-thickener or water-extractor. The pulp is then carried to the separators, which liberate and hydrate the pulp fibres rendering it suitable for paper-making, thence into the knot-screen, where knots are removed. From here, it runs over sand-traps, which are long gutters or wooden troughs in which the heavy material and impurities in the pulp settle. The bulk flows on to the final screens, where all the finished fibre is let through and the coarser stuff retained for further treatment in edge-runners or other refiners.

The pulp, when well screened, is carried over a pulp-thickener into stuff-chests, which supply the drying machine. This latter is of a similar design to an ordinary paper-making machine. The pulp passes through the machine in a continuous thick sheet, which at the end of the machine is cut up into boards of the desired size. They are then stacked and pressed into bales and bound up for shipment.

Strong Sulphate Pulp "Kraft" Manufacturing Process

The many advantages obtained by the manufacture of strong sulphate pulp have of late brought this industry into prominence.

Practically every kind of wood may be used, and mills are often installed in connection with saw-mills, thereby utilizing slabs and waste wood which otherwise would be of little value.

There is no need for careful barking, and the logs or slabs are cut endways in powerful chipping machines, producing chips and chip cakes which break into which lumps, blown into a desintegrator, dividing the cakes into suitable chip pieces. From the desintegrator the chips are carried to screens which resawdust, move knots, and splinters,

and thence by a conveyor to an elevated storage bin to facilitate automatic filling of the digesters. The digesters, which usually work with a pressure of six to seven atmospheres, are filled with chips and then with liquor, which is heated externally and circulated by a suitable system where scum and impurities are removed. The acting agent in the liquor consists mainly of various chemical combinations with sodium as well as sulphur.

When the digesting process is finished, the pulp is blown out through a pipe system to a battery of diffusers. At this stage the pulp contains a large amount of "black liquor" which has to be removed by washing. When the pulp is cleaned it is let down into large bins or stuff-chests, from which it is conveyed as required to

the screen-room. The "black liquor," which is washed out of the pulp in the diffusers, is conveyed to storage tanks in the soda recovery plant. From here it goes through a system of evaporators and from these into rotating soda burners, so that when water has been removed, only a black powder remains. This powder is poured into a melting furnace together with some sulphate of sodium, and here all burns and melts under a powerful air-current. The molten stuff flows from the furnace into the solution mixers, where the raw soda is dissolved in the "weak liquor." When the solution is sufficiently strong, it is pumped up into lime mixers where limestone is added, and the whole solution well stirred and mixed. This solution is called the "white liquor," and has to be altered carefully before being used in the digesters. The deposit left at the bottom of the lime mixers (called "mesa," mainly containing Ca CO₃) is against stirred, washed, and treated in a lime filter, and presses containing about 50 per cent. moisture. In some the effluent constitutes the "weak liquor" Suitable tanks or "mills more water is extracted by drying. Usually the pulp containers for these various liquors must be arranged.

from which the pulp comes out in the shape of a thick wet sheet. This is torn up in special machine, and the pieces taken by a conveyor to battery of edge runners submitted to a lengthy thorough treatment, to insure fibres that all completely separated. It is conveyed now stuff-chest placed immediately in front of the drying machine. This is arranged the same principle as an ordinary papermaking machine, and the pulp sheets leave the machine in a consheet, tinuous which is cut up

into boards. These are stacked, pressed together, and baled for shipment.

In cases where the wood is suitable, it is advisable to combine the pulp-making with complete by-products recovery plant, as such valuable and marketable stuff as turpentine oil and resin may be easily recovered.

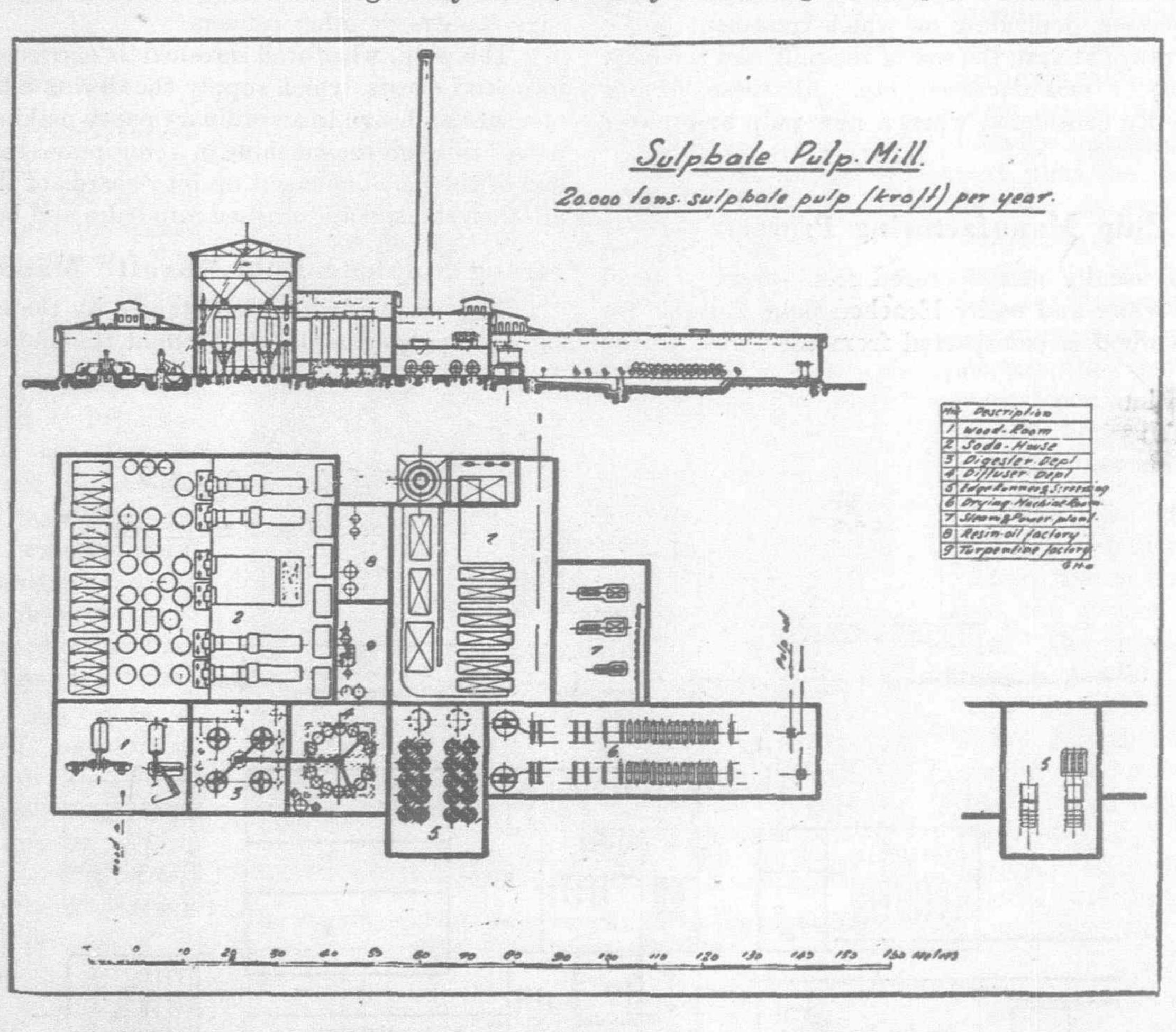
Mechanical Wood Pulp Manufacturing Process

In a mechanical wood pulp mill the logs are usually cut into suitable lengths and carefully barked, ready for grinding into so-called "white mechanical." In some mills the wood is steamed in special boilers before grinding and the so-called "Brown mechanical" pulp produced. This process can be done either by "hot" or "cold" grinding. Cold grinding is effected under moderate pressure between wood and stone, the pulp being washed away by an ample quantity of water. In hot grinding the pressure is extremely high and the water quantity reduced to a minimum, so

that a very high temperature is obtained by means of friction between wood and stone. Hot grinding has been in more general use of late years owing to its being more economical and the pulp obtained of higher quality. The grinding is done by means of hydraulically operated pressure, pistons mounted on the grinders force the logs hard against the rotating sandstone, whilst water is flushing away the pulp fibres as they are ground off the logs. The pulp passes through coarse and then through finer screens. through which only the fibre of sufficiently fine quantity can pass. The coarser pulp is pumped to the refiners, and when well refined. back again to the screens. The screened pulp flows to the wet machine (pulp vat) where most of the water is extracted, so that the pulp comes out in solid sheets. These sheets are pressed in presses and more water extracted. The pulp sheets leave the sheets are taken from the wet presses to the baling presses, where In the screening department the pulp is treated as follows: the sheets are made up into suitable packages, which are then First it goes to knot screens and thence over large dehydraters, ready for transport to paper mills to be further treated for

paper.

Water power is very important for a mechanical pulp mill. The station power as well as the pulp machinery must be of good design, and naturally the power department and the pulp department must be built in conjunetion with each other to suit local conditions. cases it some advanmay be tageous to build the pulp mill at distance some the water station, power is then which electrified the power transmitted to electric driving motors the machinery in the mill.



Paper Making and Paper Machines

Pulp sheets require a further extensive treatment such as bleaching, beating, refining, coloring and sizing before fit for paper making. Space does not admit an elaborate description of these various processes and it may only be said, that most of this refinement and treatment takes place in the so-called beating engine or hollander, where the fibre is exposed to a series of continuous mixing, desintegration, beating, brushing, softening, etc. The treatment of the fibre in the beater is most important and varies greatly for different kinds of papers.

From the beater the pulpy mass of fibres is emptied into stuffchests with agitators, suitably diluted with water and then pumped on to the sand tables where heavy and gritty particles are kept back. The diluted pulp is then passed through strainers, where knots and dirt are separated and it is then ready to enter the papermaking machine proper to be made into paper.

Paper Machines

The paper machines for various qualities of paper can be divided into four different groups: (a) Multicylinder machines: (b) one cylinder machines (Yankee machines); (c) combined machines: (d) card-board machines.

- (A) Multicylinder machines may be further divided into several sub groups:
- (A 1) Machines for Printing Paper and News.—These machines are usually built for great outputs of up to 75 tons (or more) of newspaper per 24 hours. They have a width of up to 160 or 200 inches and a speed of paper of up to 1,000 feet per minute.
- (A 2) Machines for Book Paper, Writing Paper, Drawing Paper, etc. These higher qualities of paper necessitate a machine having slower speed, usually not more than 300 feet per minute, and a width of paper of seldom more than 120 inches.
- (A. 3) Machines for Wrapping Paper.—These machines are built similar to the above types with variation in design for different
 - requirements, such as "Manila" paper, "Java" paper, etc. Machines for "grease proof" for instance are among other things designed with especial consideration for the immense shrinkage of the paper web during its run through the machine.

(A. 4) Machine for Cigarette-Paper.—The manufactures of such thin paper requires the utmost skill in the treatment of the fibre as well as an exactly suitable design of the paper machine.

Comparatively short wire-net with powerful shaking motion, easily movable and well adjusted rolls and presses, and small drying section are some of the features for this type of machine. The width of the machine is usually 40-60 inches and the speed seldom more than 100-125 feet per minute.

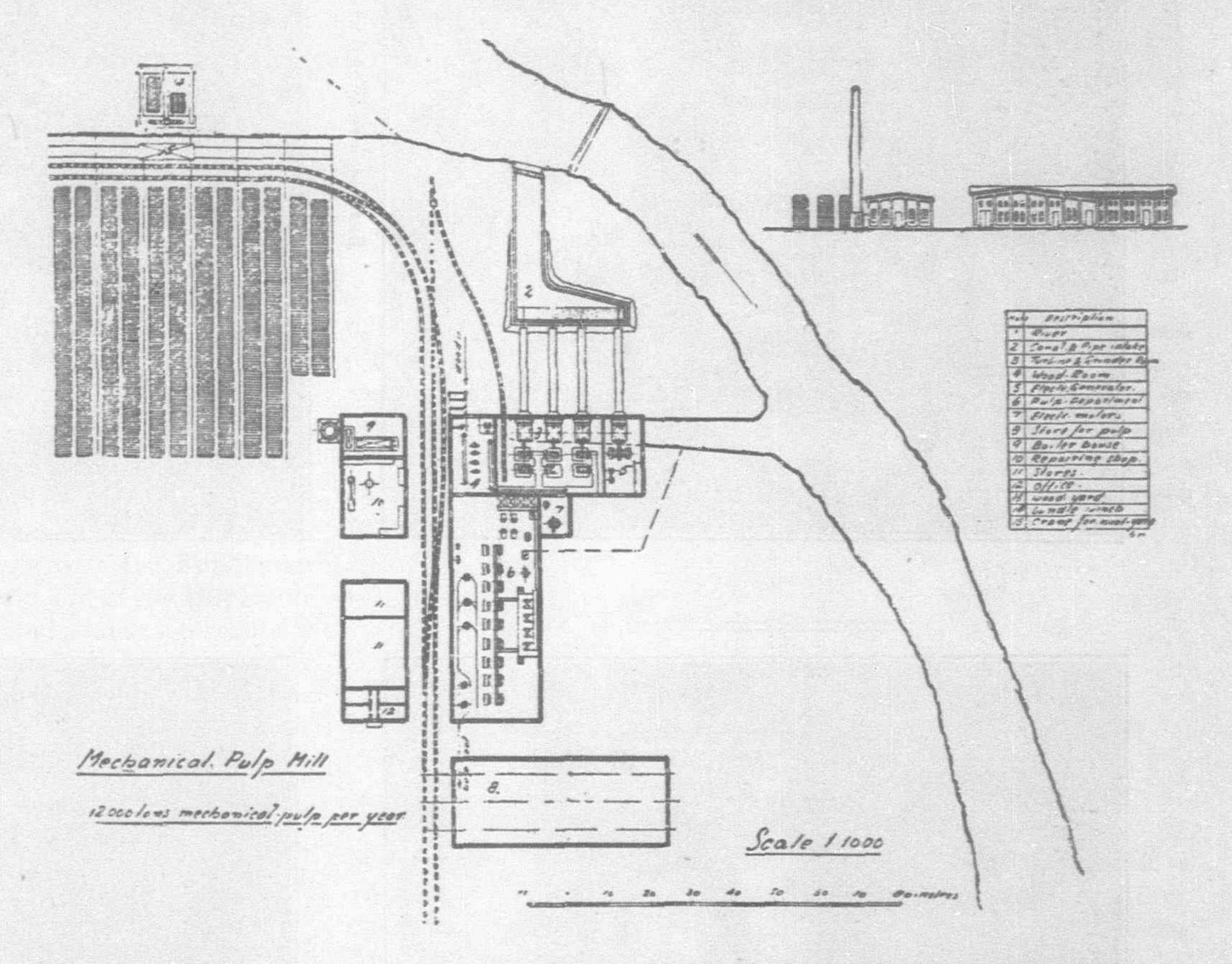
- (B) One Cylinder Machines.—These machines have the wire-section and wetpress section built in the usual way, but the special feature of the machines is that the drying section consists of only one large drying cylinder of 10 to 12 feet diameter. A highly polished surface on the drying cylinder is of paramount importance with the result
 - that the side of the paper which comes in contact with the cylinder gets a glazed and well finished surface. One cylinder machines are built up to 160 inches width and for capacities of up to 30 tons M. G. paper per 24 hours.
- (C) Combined Machines may be further divided into several sub groups:
- (C. 1) Machines for Tissue Paper.—This type of machine has the usual design of wire and wetpress section from which the paperweb is automatically carried over one large drying cylinder and thereafter, while it still is moist, over three ordinary dryers. Both sides of the paper receive thereby a uniform surface before passing through a callander.

The best qualities of tissue paper are usually manufactured from pure cellulose pulp in the weights of from 12 to 25 grams per sq. m.

(C. 2) Machines for thin printing paper are of similar design as the machine for tissue paper but with the addition of several more ordinary drying cylinders.

These type of machines are usually built for a width of 80-120 inches or more and a speed of 150-250 feet per minute. They are especially suitable for manufacturing of thin news-

- paper and thin printing papers with a weight of 25-45 grams per sq. m.
- (C. 3) Machines for Thicker Qualities of Paper.—This type of machine is a combination of a multicylinder machine and a one cylinder machine in such a way that the large drying cylinder is placed after the ordinary cylinders in the drying section. If one-side glazed paper is required the last large cylinder can produce a sufficient glazing without the use of a callander. This type of machine is also suitable for making ordinary news and printing paper of usual qualities, and is built for any normal speed and capacity.
- (D) Card Board Machines.—For making thin or thick card board, duplex or triplex papers, etc., a machine of different design than the usual Fourdrinier machine is used. Instead of the wire net there is a serie of up to eight large vats, in each of which a large drum or cylinder revolves. The cylinders are covered with wire cloths and have outlets at both ends with tightening bands against the ends of the vat.



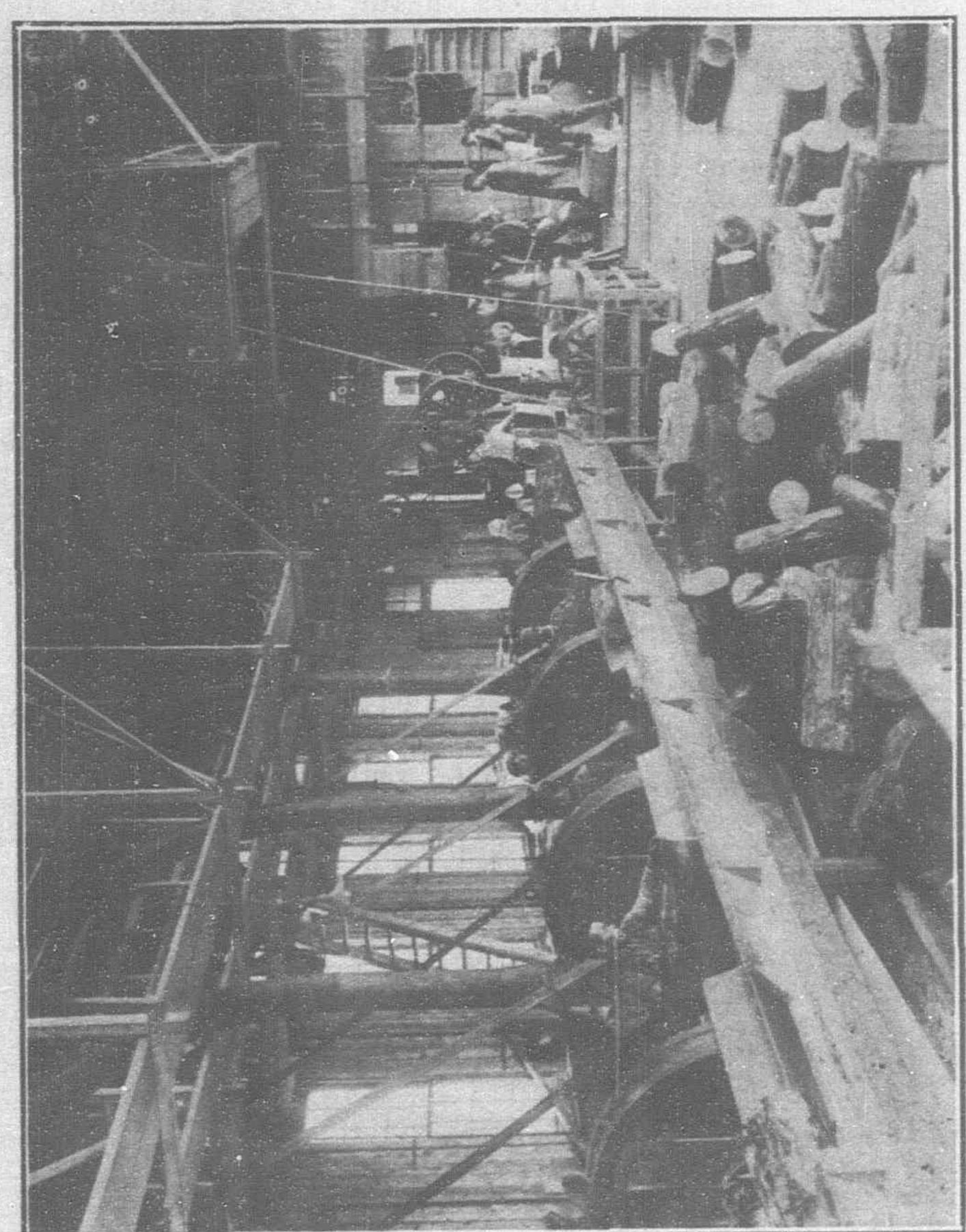
The diluted pulp is led into the vats, the paper web is formed on the cylindrical wire-clothed surface as the cylinder revolves, and the water passes through. The paper sheet is taken away by an endless felt, which passes over a serie of several vats. In this way the paper webs from different cylinders are couched in succession as superposed layers on the same felt. In this way a thick paper board can be obtained which afterwards receives the usual treatment through wet-presses and drying cylinders before reaching the callander and cutting apparatus. This type of machine is built up to 120 inches or more in width and for a capacity of 20-30 tons of card-board per 24 hours. Thickness of board is usually up to 2,300 grams per sq. m.

Development of Pulp Manufacture in Saghalien and Hokkaido

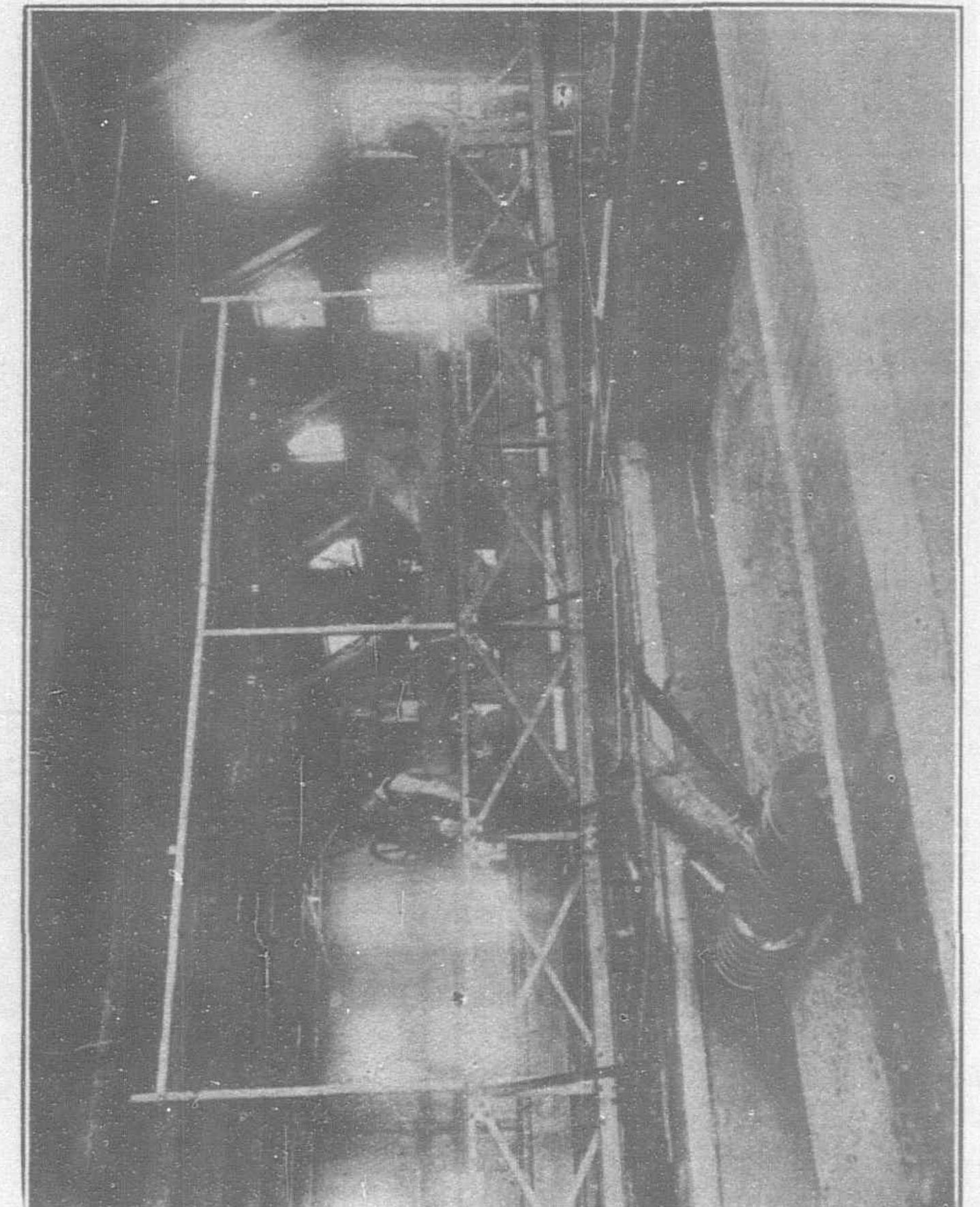
The first pulp mill erected in Japan was built by American engineers for the Tomakomai Paper Mill of the Oji Paper Manufacturing Co. In 1914, the first pulp mill in Saghalien was built at Otomari for the Oji Paper Mfg. Co., the equipment consisting

OCHIAI MILL OF THE FUJI PAPER MFG. CO., LTD.

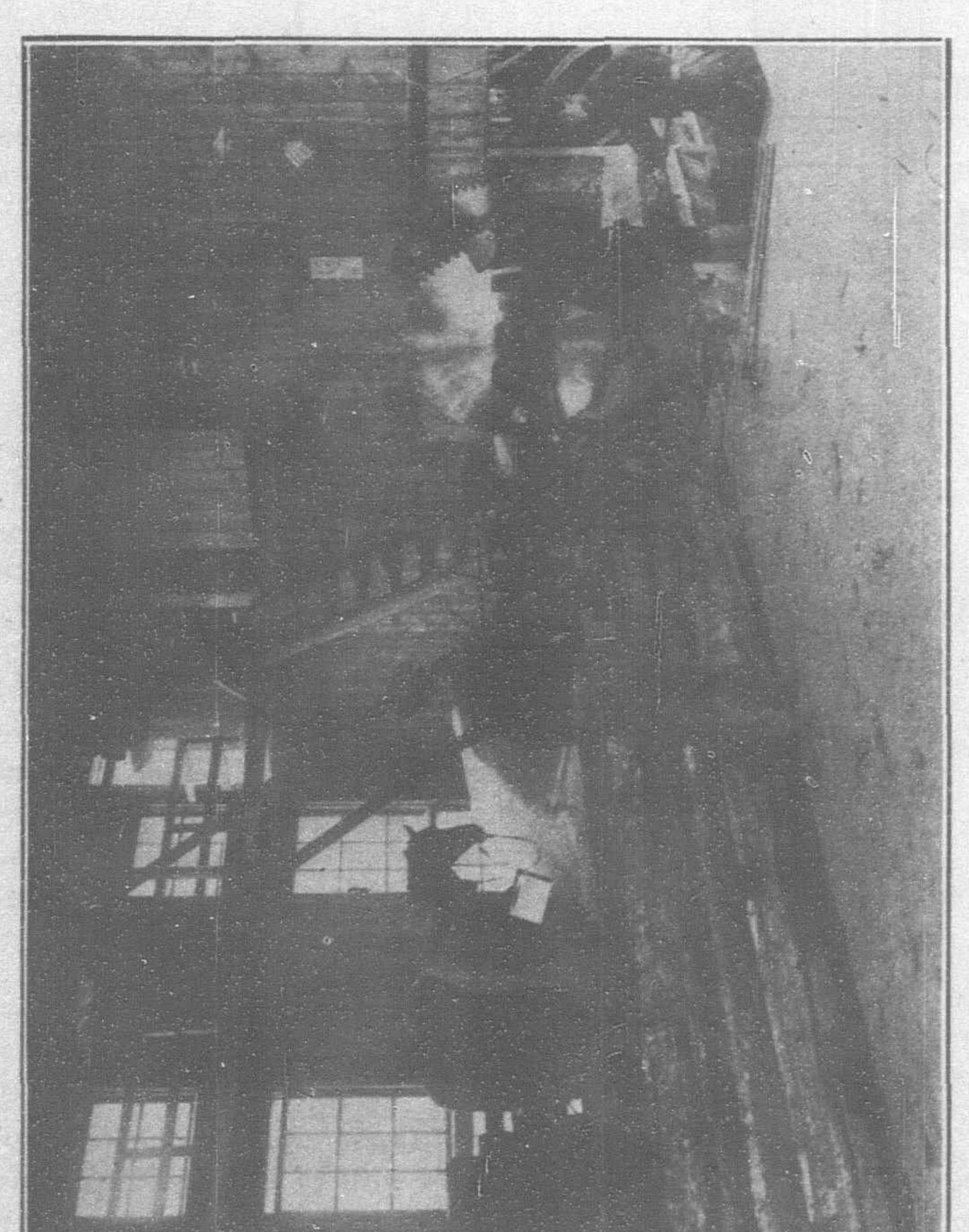
Erected at Ochiai, Saghalien, by Boving & Co., Ltd. with Karlstad Machine Works Equipment

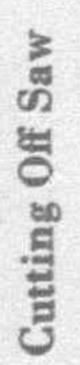


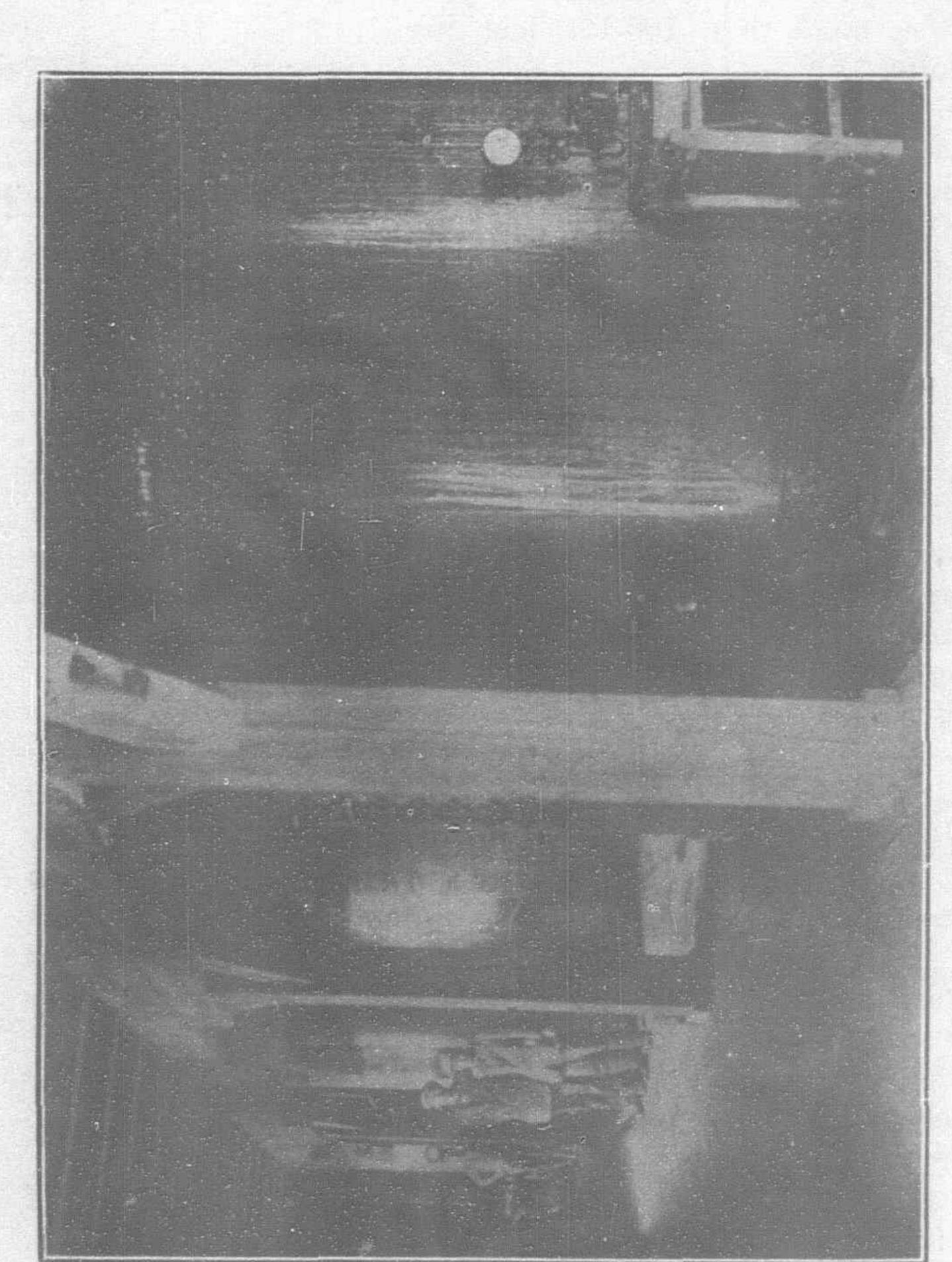
arking and Wood Cleaning Machines



Pulp Digging Apparatus Operated by One Man







75-lbs. per sq.-in., each cooking lasts 15 hours and produces 11 tons of pulp

of Babcock and Wilcox boilers, Escher Wyss steam turbines and all the paper machinery from the Karlstad Engineering Works, of Sweden.

At the end of 1914, the second pulp mill in Saghalien was ordered by the Karafuto Industrial Co., Ltd. The mill was built at Tomarioro, and all the machinery supplied by the Karlstad Engineering Works. The Oji mill was started up in the spring of 1915, and the Tomarioro mill in August of the same year. Three weeks later, the Karafuto Industrial Co., Ltd., ordered equipment to double the capacity of the mill. Its capacity is now 15,000 tons a year, and the equipment consists of four 11-ton digesters, two automatic pulp digging machines, two pulp separators, four knot screens, and eight screens for fine pulp, four water extractors, and two drying machines, each having 18 drying cylinders. The acid department consists of two sulphur burners, two gas cookers, three acid towers; and the wood cutting department is equipped with one cutting off saw, with automatic feeding arrangement, four barking machines, one chipping machine with chip crusher, one chip screen; and in addition all the accessory machines and conveyors, pumps, etc , in each department. Later on the Tomarioro added another digester with accessory machinery which increased capacity 9,000 tons.

In 1916, the Nippon Chemical Pulp Co, Ltd, installed a new pulp mill at Ochiai, in Karafuto It is equipped with four digesters, and two drying machines, besides all accessory and intermediate machinery, as at Tomarioro. This is the first Japanese pulp mill operating with the indirect cooking system. This company was later amalgamated with the Fuji Paper Mfg. Co, Ltd, and in 1917 the mill was started up. At the same time the Fuji Paper Company was building another Sulphite Pulp Mill in the Hokkaido, at Ikeda, which consists of three digesters, and similar intermediate and accessory machinery as at Tomarioro, and one drying machine with 26 drying cylinders. The capacity of this mill is 15,000 tons a year.

In 1917, the Oji Paper Mfg. Co. ordered another mill to be erected at Shingishu, Korea, at the mouth of the Yalu river. This mill consists of two digester, one drying machine with 18 cylinders, and with all intermediate and accessory machinery, to produce 9,000 tons of pulp a year. This mill was started up in 1918. At the present time owing to the rather depressed condition of the domestic pulp industry it is closed down.

In 1920, the Oryokko Paper Co. erected a Sulphite Pulp Mill at Antoken, near Shingishu, Korea. Its equipment consists of three digesters, with all intermediate and accessory machinery. The drying machine for this mill was supplied by Horne & Co., and is of American manufacture. It is the only machine since 1914 not supplied from Sweden. This mill produces 15,000 tons a year, when in operation to capacity. It is now closed down.

Beginning in 1920, the Oji Paper Mfg. Co. built another mill at Nodasan in Karafuto which consists of two digesters, one drying machine with 20 cylinders, and all accessories to produce 9,000 tons of pulp a year. In 1921, an extension was made to this company's Komakomai mill, one digester, being imported from Sweden, which increased production to more than 15,000 tons a year.

Japan now is able to produce a minimum of 100,000 tons of pulp a year. The country annually uses about 180,000 tons of paper for export and domestic use. The balance of the pulp required is imported from Sweden, Canada, and European countries. The fact that the domestic production is not sufficient to supply demand is a favorable factor in the future of the industry. But



"Karlstad" Drying Machine in full operation at the Ochiai Chemical Pulp Mill in Saghalien

industrial depression has so lowered prices in Japan that it has been difficult for the home manufactured pulp to compete with imported pulp. The strike in Sweden, and the rise in Anglo-American exchange have somewhat assisted the Japanese market to get back on its feet since the first of the year. However, the future does not promise prices higher than those now prevailing; say 8-9 sen per pound for unbleached and 10½ sen for bleached.

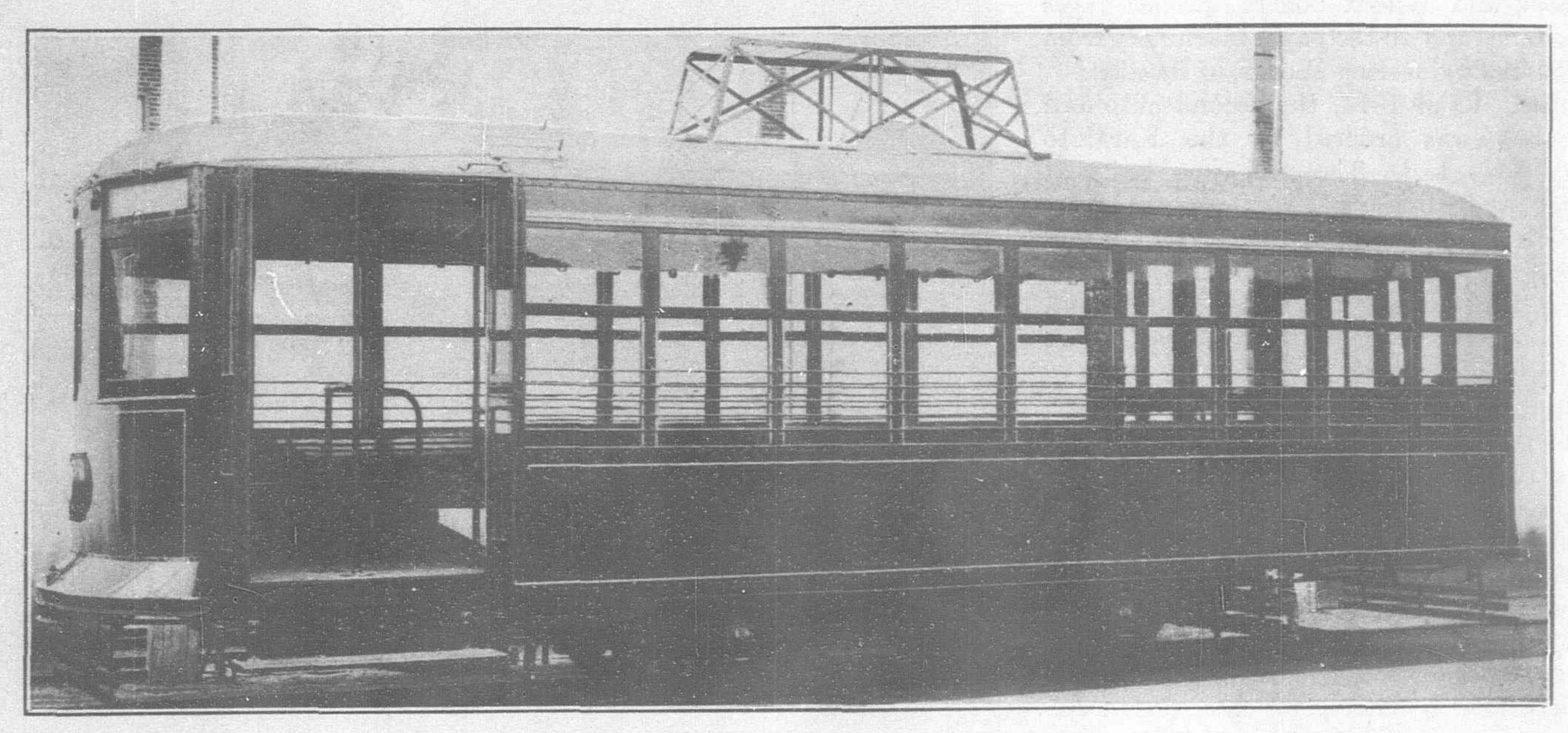
A HYDRO-ELECTRIC PLANT IN HOKKAIDO

(Continued from page 252)

power house, built of stone and concrete, is equipped with a Hidachi "Frontal" turbine having a maximum of 3,330 h.p. operating at 375 r.p.m. direct connected to a Hidachi revolving field type alternator of 2,750 k.v.a. 3 phase, 50 cycles, 6,700 volts, 375 r.p.m. and 80 per cent. power factor. The exciter is 35 k.w., 110 volts, compound wound direct connected to the generator shaft. The water turbine governor is of the automatic oil pressure type made by the Hidachi Works.

The station transformer is 25 k.v.a. single phase, 50 cycle, automatic oil cooled, transforming from 6,770 volts to 105 and 210 volts. There is also a three-phase induction alternating motor of 200 volts, 1,000 r.p.m. 50 cycles connected to a direct current generator of 35 k.w., 110 volts.

Between the generator and the busbar there is a time limit relay with automatic oil circuit breaker to regulate the phase. The brake is operated by hand or by the direct current brake of the switchboard, operated by magnet coils. The 6,770 volt busbar has a three-phase static ground detector between the primary coil of the transformer for the induction motor and the 6,770 volts busbar, there is a similar automatic oil circuit breaker, but instead of a time limit relay, a reverse time limit relay is installed. All the instruments and other equipment of the switchboards were manufactured by the Shibaura Engineering Works of Tokyo.



Exterior of Birney Safety Cars operated by the South Manchuria Railway Company at Dairen, Built by the Brill Company

Public Transportation

The J. G. Brill Company, Philadelphia, Largest Builder of Electric Railway Cars and Trucks in the United States, since its Inception 55 Years Ago, has Produced Many Interesting Types of Public Transportation Vehicles

ROM horse-drawn to electric railway cars" expresses the progressive development which has been characteristic of the history of this foremost American car and truck builder. Electric railways as a transportation agency, are of comparatively recent

origin, the first successful operation in the United States being that at Richmond, Virginia, in 1885. The leadership which the Brill Company has retained throughout the various changes of motive power on railways is attributed to its ability to adapt itself and its product to the changed requirements, and to the many inventions contributed by its engineers, which have had a most progressive influence upon the development of public transportation in the United States.

When it was evident that the electric motor was best adapted to the propulsion of street railway cars, the advantage of a truck independent of the carbody was recognized, and the development of the first system of electric car

trucks resulted from the inventions of Mr. John A. Brill, the youngest son of the founder of the company. The J. G. Brill Company had its beginning in 1868 when Mr. John G. Brill and his son, G. Martin Brill, formed a partnership known as J. G. Brill

& Son for the construction of horse-drawn cars, which then constituted the only type of street railway equipment known. Therefore, while the Brill Company may not be the oldest carbuilder in existence, it has the record in America for continuous service. In addition to its large Philadelphia plant it owns and operate

three other large plants, American Car Company, St. Louis, G. C. Kuhlman Car Company, Cleveland, and the Wason Manufacturing Company, Springfield, Mass., together with a plant at Gallardon, 40 miles west of Paris, France, known as the Cie J. G. Brill. The Brill' plants in the United States cover a total area of 92 acres (12,369 tsubos).

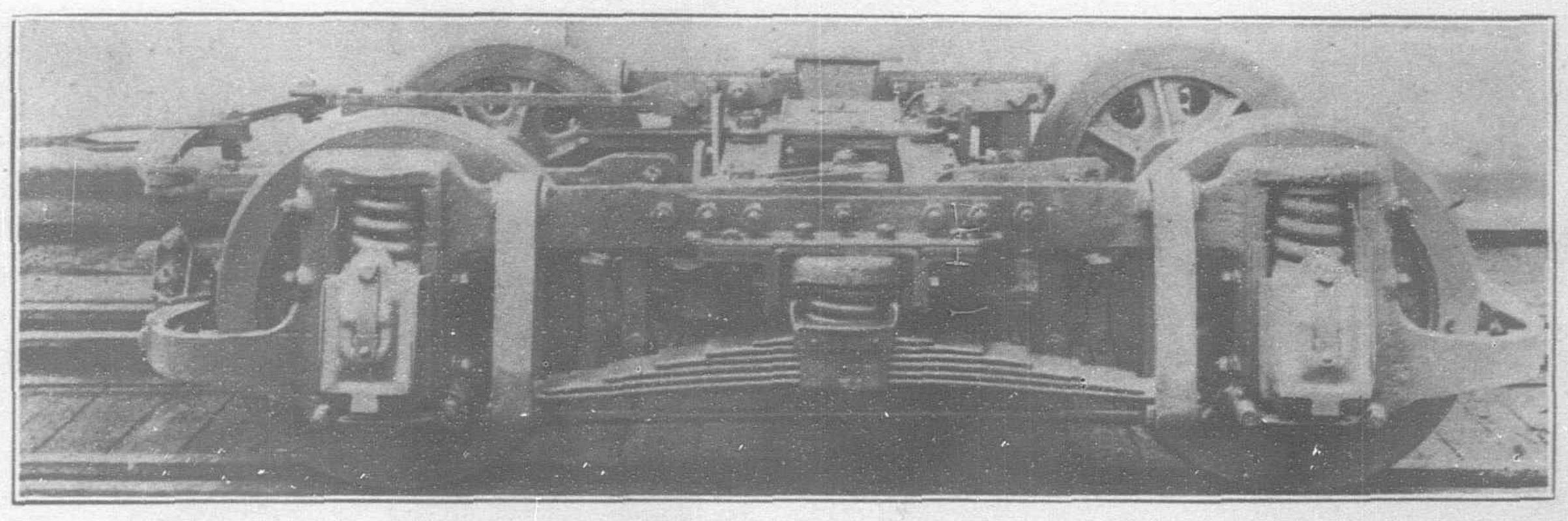
The ability of the Brill organization to construct horse car equipment to satisfactorily meet the wishes of a rapidly increasing clientéle attracted the attention of many foreign companies to this American builder, so that in 1873, the first Brill order of cars for operation outside of the United States was shipped into Mexico. Commencing with this shipment of



the world has resulted in a most extensive foreign business. The South Manchurian Railways at Dairen have in operation five (5) Birney safety cars which were constructed in

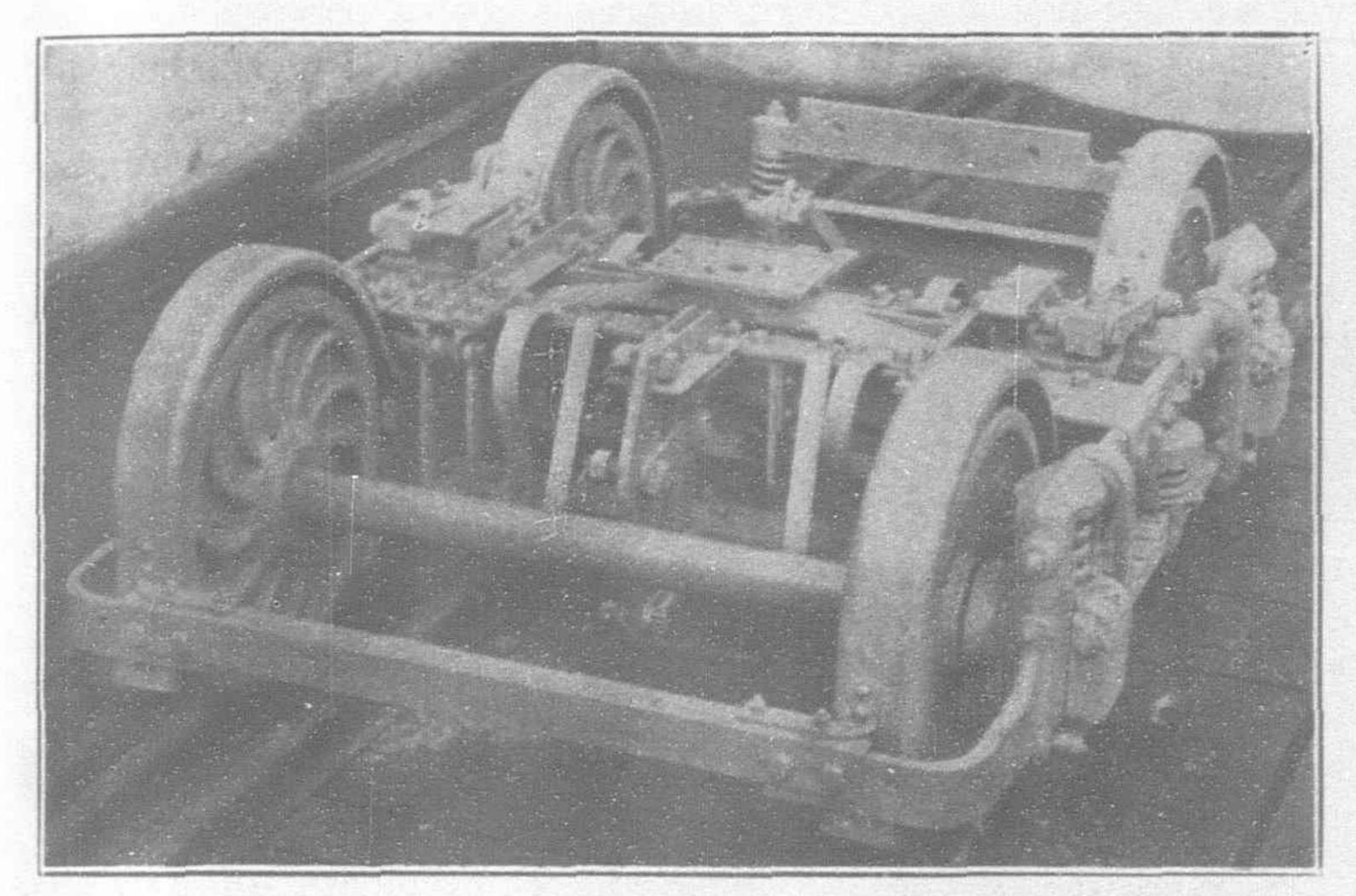


Interior of Birney Safety Car for Dairen, made by the Brill Company

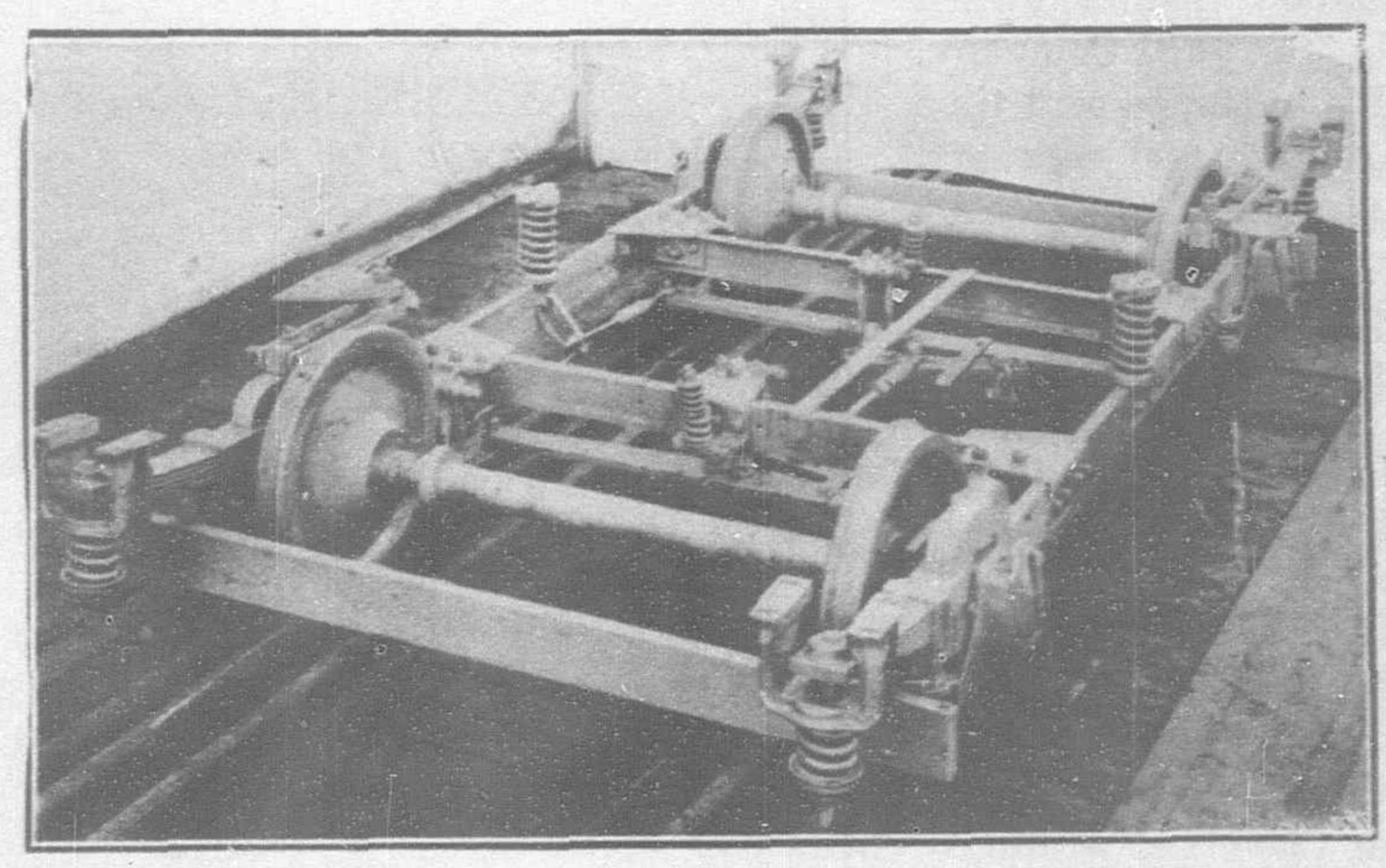


Brill 77-E Trucks for Osaka Tramways

the Brill plant in Philadelphia. These cars represent the "last on the motorman. When this foot valve is depressed the word" in street cars. To their comparatively light weight is attri- hand may be removed from the controller without setting buted an appreciable saving in power consumption and other operat- the emergency equipment in action but if the foot is removed,



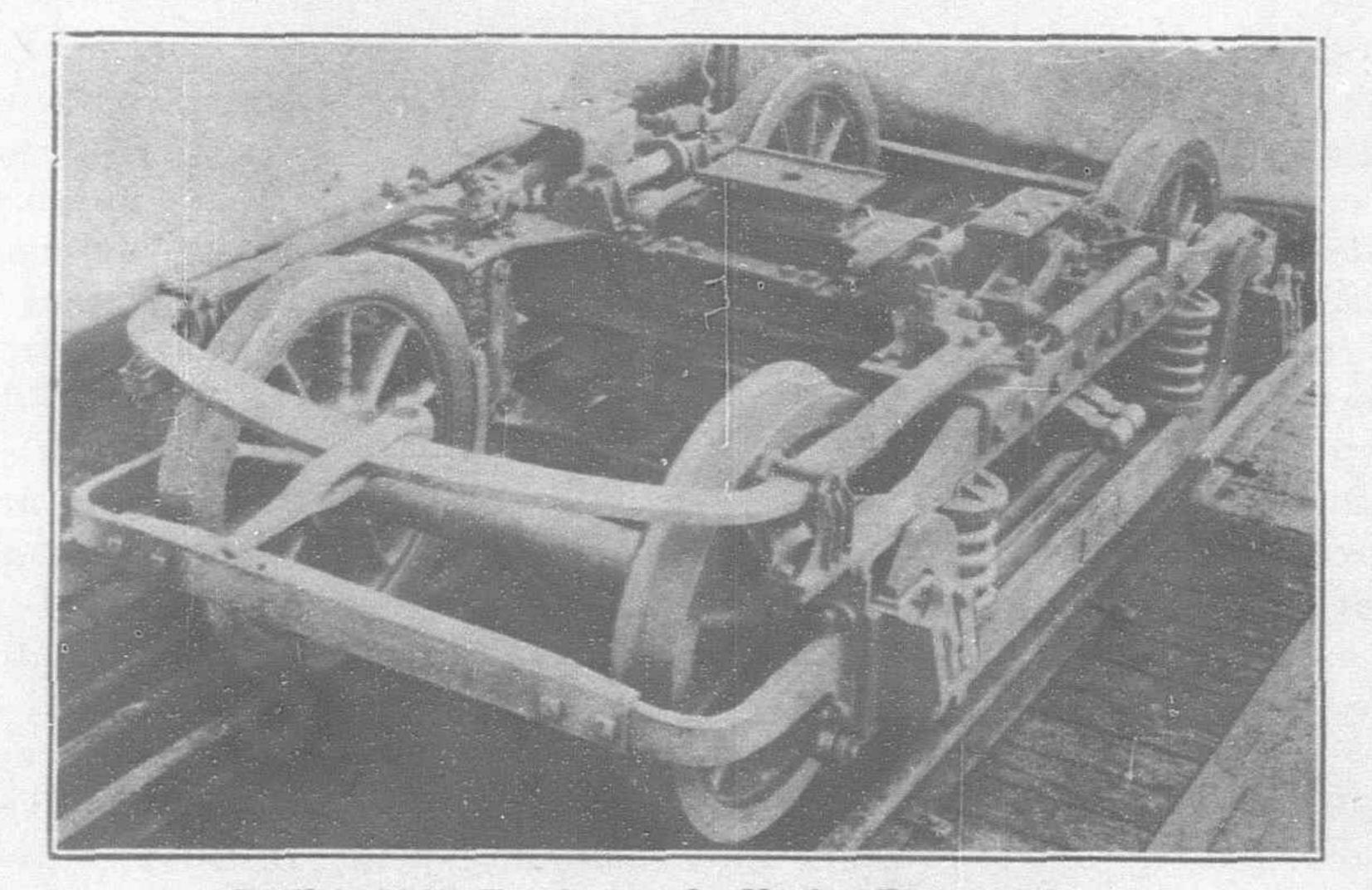
Brill 76-E Trucks for the Keio Electric Tramways, Japan



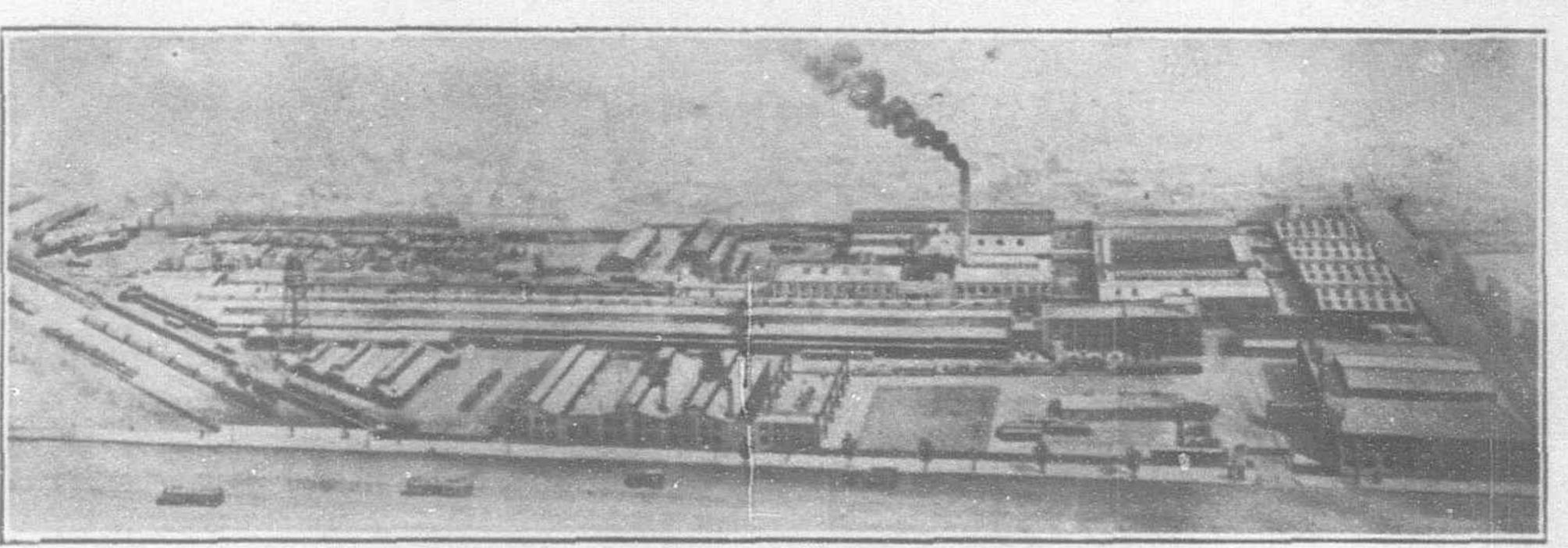
Standard Birney Safety Car Truck: Brill No. 79-E

ing costs. Being adapted to one-man operation, the mechanical devices which control the motors and brake equipment have been so interlocked that their operation is simplified and the "one-man crew" has less to do in their actual operation. The same handle which applies the air-brakes also opens and closes the air-operated doors and, at the same time, when necessary sands the track. In order to guarantee utmost safety, it is necessary for the operator to keep his hand upon controller handle includes the "dead man's" feature.

Upon the removal of his hand in an emergency without any further action on his part the power is automatically shut off, the air brakes applied and the pressure on the door engines released so that they may be opened by hand. A foot valve is provided to relieve the strain



Brill 26-MCB Trucks for the Nankai Railway, Japan



Philadelphia Plant of the Brill Company

this same automatic operation of the safety devices occurs.

Also included among the products of this American firm has been many large truck orders for service on the most important electric railways in Japan. A few of these are represented by the accompanying illustrations of high-speed trucks for Nankai, two-motor city trucks for Keio and long wheel-base small wheel-trucks for Osaka.

An idea of the extent to which Brill cars are used in the United States is given by the fact that of the 14,000,000,000 passengers carried annually by electric

> railways, which is ten times more than those carried by the steam railways, three-fifths of them ride in Brill cars, and it is practically impossible to ride on the cars in any city of importance without coming in contact with equipment built either the Philadelphia plant or one of the sub-

tion to warrant the

laying of steel rails

and the operation of

ways in the United

States have recogniz-

ed that their high cost

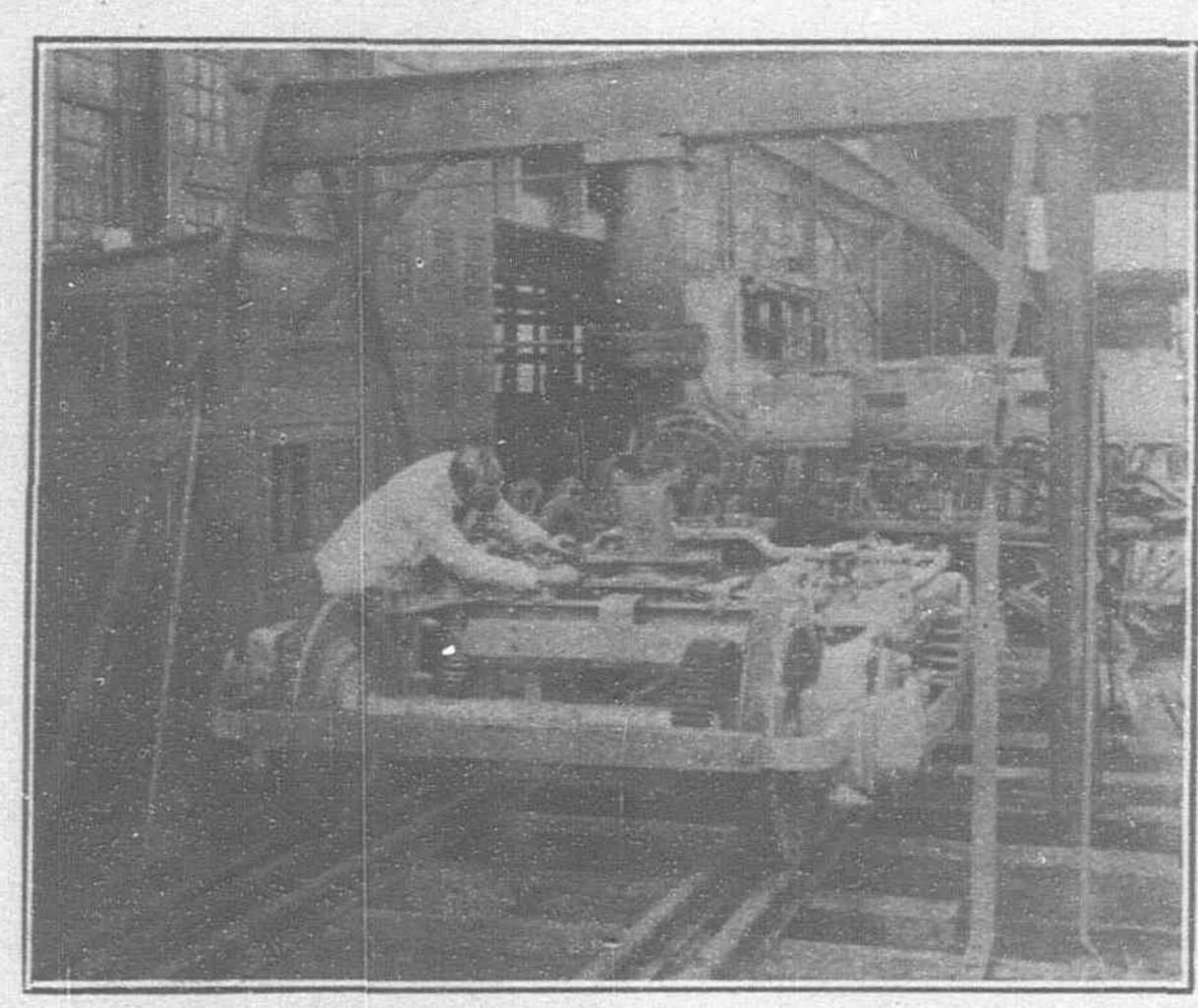
of operation has been

due largely to the use

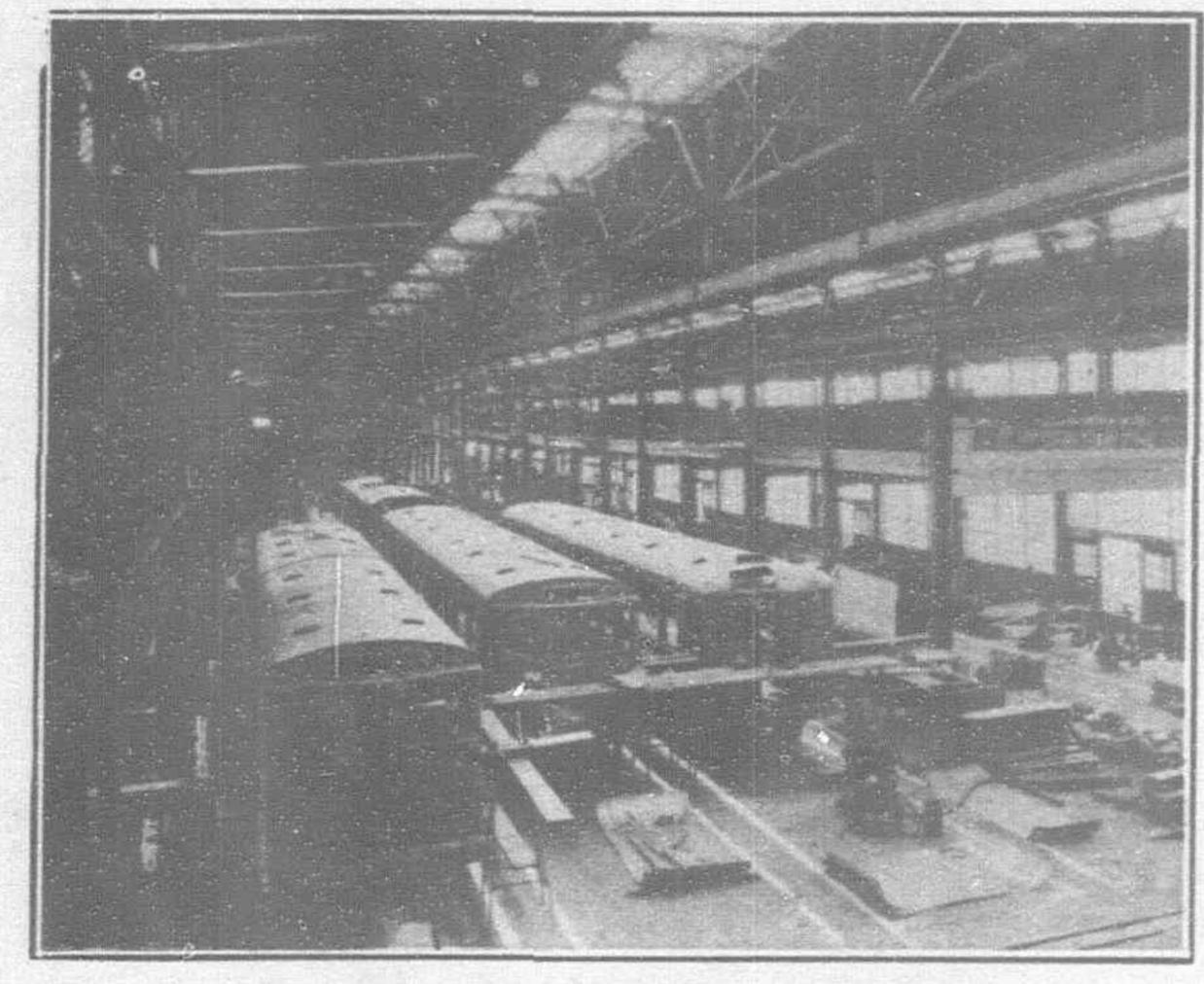
of heavy rolling stock.

The electric rail-

railway cars.



Testing Brill Trucks for Spring Capacity by the use of Hydraulic Testing Machines



Interior of Steel Car Department, Brill Works

sidiary plants owned by the Brill Company. Up to the present time over 50,000 cars and as many as 150,000 trucks have been shipped from the Brill plants.

Recently the gasoline-driven motorbus has found a place in America's transporta-

tion system. While the facilities of the Brill organization are primarily devoted to the construction of electric railway equipment, this company is actively interested in all types of transportation

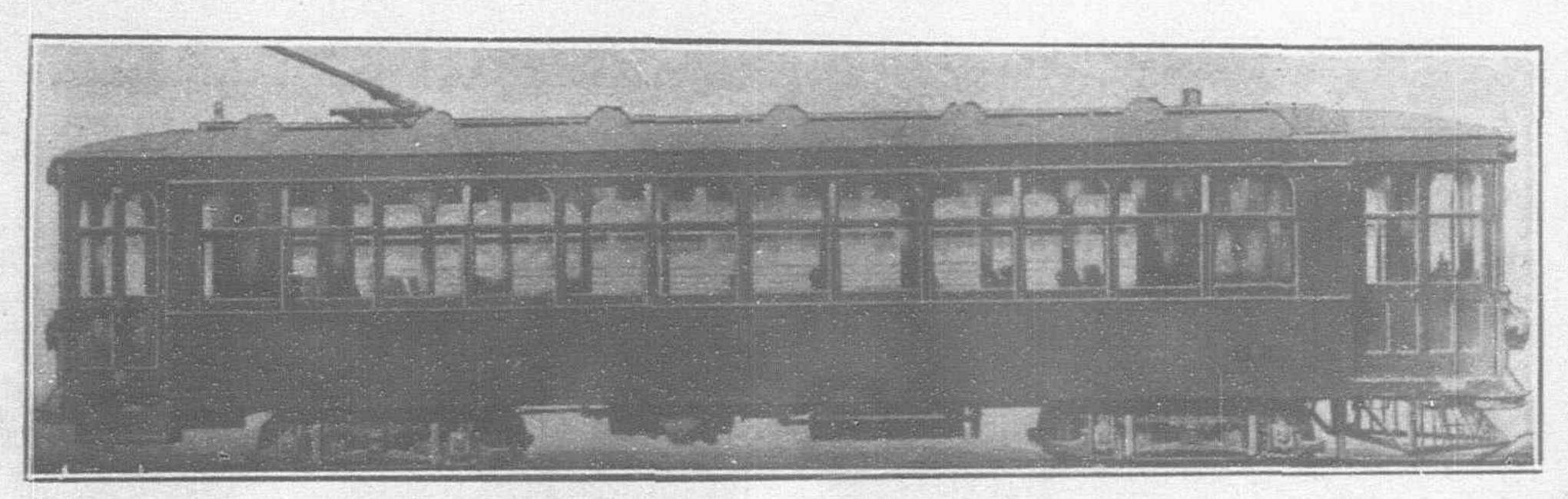
vehicles. Therefore, its subsidiary plant at Cleveland is almost entirely occupied in the production of steel frame motorbus bodies.

Also approximately 80 per cent. of the gasoline-driven motor rail cars ordered in 1922 for steam railroad service in the United States have been shipped from the Brill plant in Philadelphia. The low operating cost of these units make it possible for branch steam rail-roads to meet the transportation demands of the district served by their lines and enables them to stimulate traffic by the operation of more cars, giving increased service. The car illustrated weighs about 27,000-lbs. complete, seats 46 passengers and is operated by a 68 h.p. gasoline engine.

Another recent innovation in the

less car. While retaining the economy characteristic of electric propulsion, this vehicle has equal flexibility in operation on

the highway which is possessed by the motorbus. Thisvehicle is particularly adapted as a feeder to electric railways, for extensions of railway lines where it is not certain that there is sufficient demand for transporta-



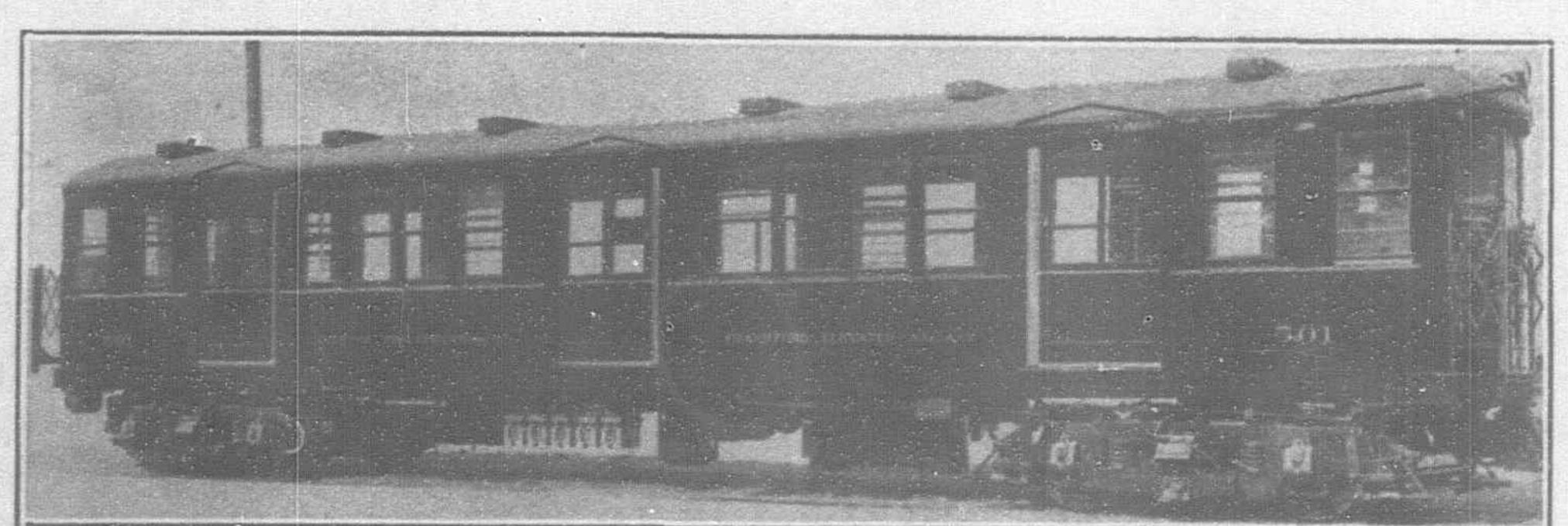
New Light Weight Brill Interurban Car

The remarkable success attending the introduction of the safety car has turned the attention of the interurban lines to the possibilities of light-weight equipment. Consequently, much attention is now being given to the

development of cars which will meet the high-speed requirements of intercity service from the standpoint of durability and comfortable riding and, at the same time, obtain the maximum reduction in operating costs. Many cars have been placed in service on interurban lines where the speed requirements are low but the most recent development has been the type of car now in service on the Western Ohio Railway where a speed of 45 miles per hour is reached. These cars are of combination passenger and baggage type and were produced by the Brill plant at Cleveland. They are mounted on Brill 77-E low level trucks, weigh 33,000-lbs. complete and seat 48

passengers.

Brill Rail-less Car The reputation which has been public transportation field is represented by the Brill railbuilt up by the Brill Company in America is so well established that its name and street cars are practically synonymous.



All Steel Brill Car for the Frankford Elevated Railway

This reputation has also spread throughout the world. In Central and South America, Europe, Asia and Africa, there are in existence rolling through the streets of some of the most principal cities street cars which bear testimony to the enterprise of this foremost American carbuilder.

Amazing Growth of Japanese Shipping

The Story of the O.S.K.

STUDY of the balance sheet and accounts of the Osaka Shosen Kaisha, familiarly known all over the Pacific as the "O.S.K.," as shown in a recent issue of Fairplay, brings foreibly to mind the tremendous progress made by Japanese shipping during recent years.

This company started in 1884 with an authorized capital of Y.1,800,000 (\$900,000), of which a little more than half was paid up, and a fleet of 92 steamers, aggregating 16,458 tons gross, running between ports on the Inland Sea of Japan.

It was formed by a combination of many small independent steamship owners, mostly operating from Osaka, and was directly

encouraged by the Japanese government, which was anxious to put an end to the reckless competition on freight rates then going on.

Battle for Life

The original capital was represented principally by the steamers which were turned over to the company, all small boats, averaging less than 200 tons each, many of them badly in need of repairs, as the low freight rates had prevented the necessary expenditures, being made for their upkeep.

The first few years of its existence the company had a hard struggle, owing to the strong competition of the individual owners who had

remained outside the combine and the lack of sufficient capital to replace its old, worn-out steamers with more efficient tonnage.

In 1888, although its freight and passenger earnings had increased about 50 per cent. over 1884, its fleet had decreased to fifty-nine steamers of 13,156 tons gross.

In that year, however, in response to the appeal for assistance, the Japanese government granted it an annual subsidy of Y.50,000 (\$25,000), running for eight years. This subsidy was granted on the condition that the company keep open, free of charge, the regular routes on which mails were to be carried and also that it should improve its fleet by gradually desposing of its older vessels and ad-

ding new ones. From this time on the company began to go ahead, although its progress was comparatively slow

for the next few years.

A Navigation Law

In 1896 the Japanese navigation encouragement law was passed, providing for a general shipping subsidy based on mileage covered and tonnage. This was superseded in 1910 by the ocean lines subsidy law, granting a subsidy to steel liners of over 3,000

tons gross and twelve

knots speed, running to

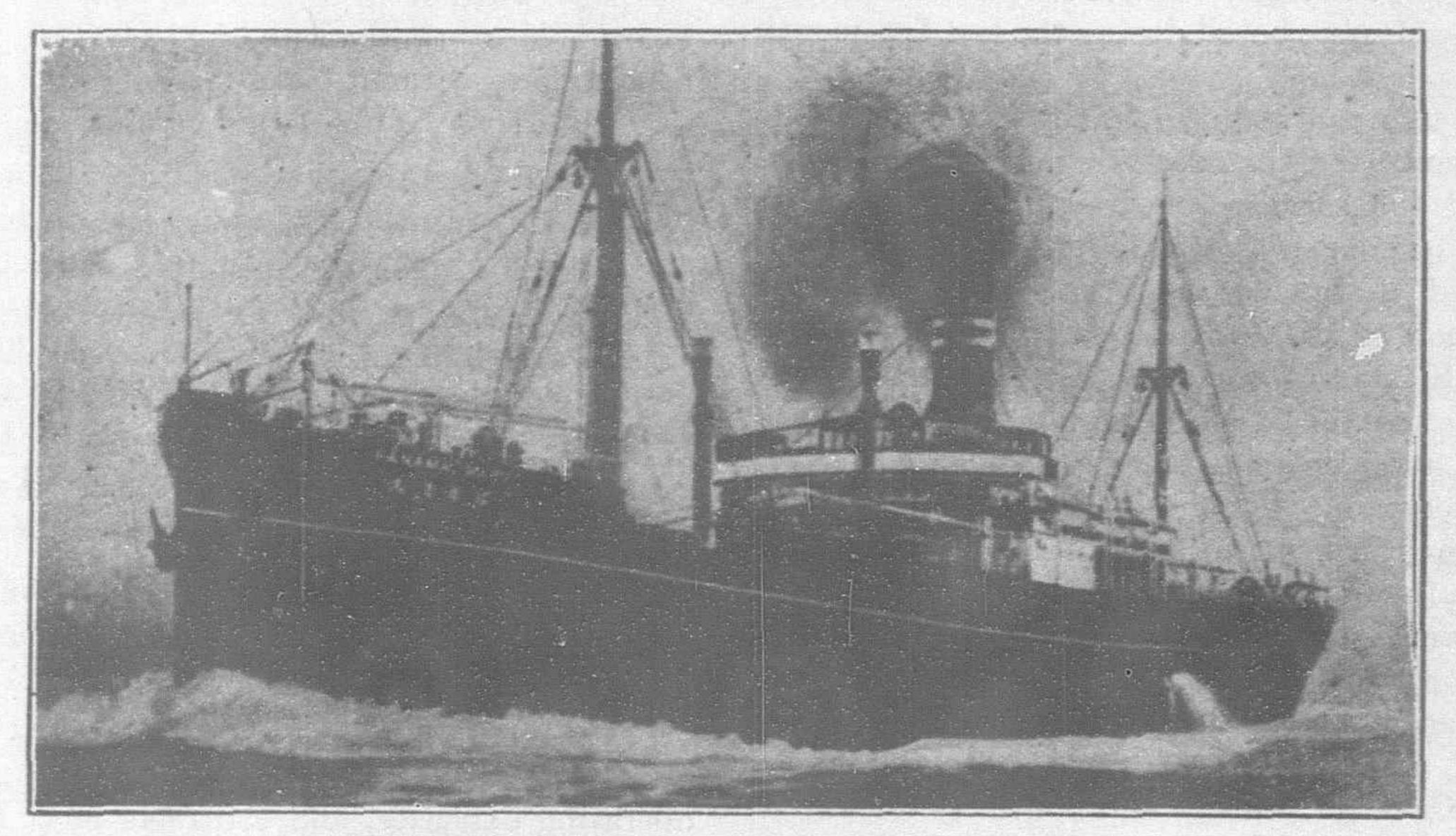
North and South Am-

erica, Europe and Aus-

tralia.

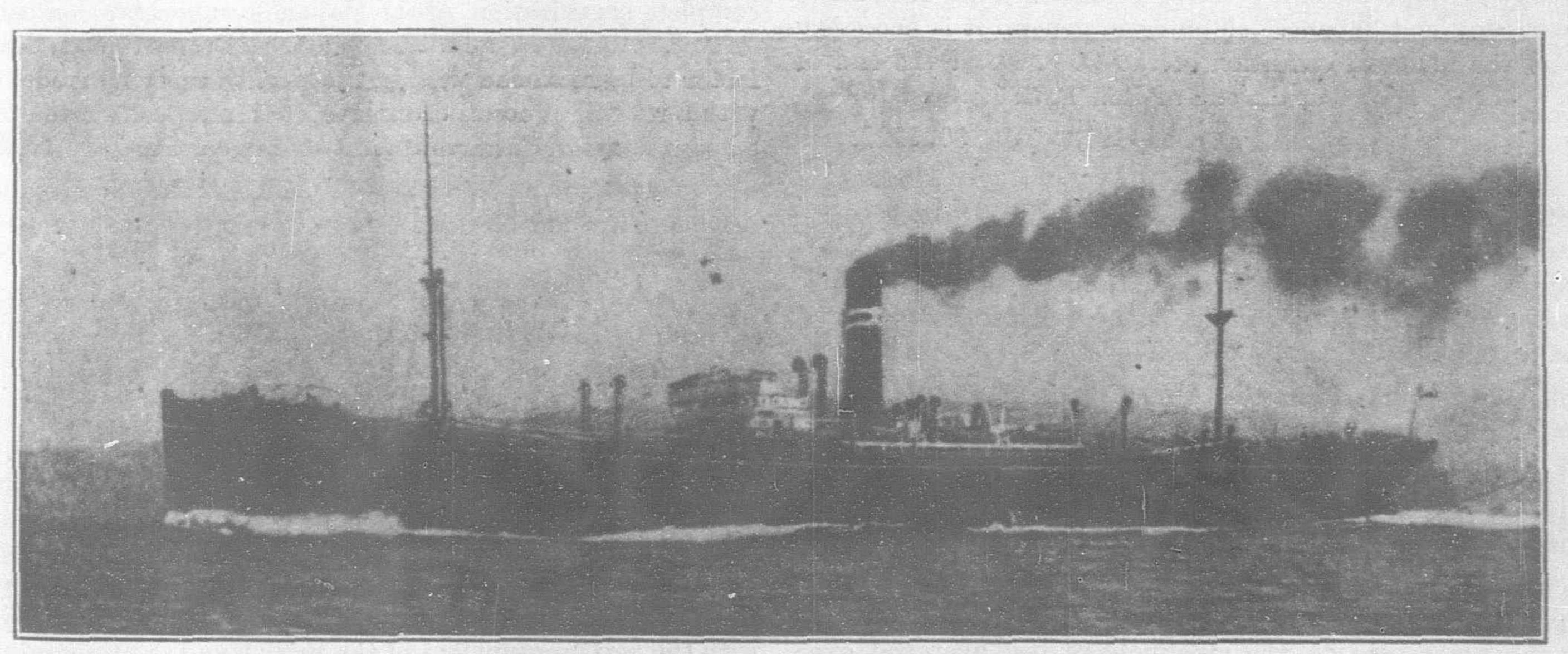
The latter law also provided that the subsidized ships must con-

TYPES OF O.S.K. STEAMERS



Passenger and Cargo Steamer "Panama Maru"

400-ft. by 51-ft. by 32-ft. 6-in. moulded; 2-Triple expansion engines (3 Boilers-14-ft. 3-in. by 11-ft. 6-in.; 1 Boiler-12-ft. by 11-ft. 6-in.) by 200-lbs. pressure; Water ballast 1,797 tons; Cubic capacity 343,000 cft.; Total bunker 1,500 tons; 13 Steam winches; Gross tonnage 5,000 tons; Deadweight 7,130 tons; Speed 14 knots; Passengers: 1st class......9, 3rd class.....186.



Passenger and Cargo Steamer "Africa Maru"

475-ft. by 61-ft. by 32-ft. 9-in. to upper deck moulded. Shelter deck type; 2-Triple expansion engines; 5 Boilers; 15-ft. by 12-ft. by 200-lbs. pressure; Water Ballast 2,368 tons; Cubic capacity 530,600 cft.: Total bunkers 2,700 tons; 14 Steam Winches; Gross Tonnage 9,500 tons; Deadweight 11,000 tons; Speed 161 knots; Passengers: 1st class........42, 3rd class......304

form to government requirements, especially with regard to freight and passenger rates and general conduct of business. Up to the end of 1916 over Y.144,000,000 (\$72,000,000) had been paid out by the Japanese government in shipping subsidies under these two laws.

In 1890 the company began its first run outside of the Japanese coasting trade with a line to Korea. This was followed by a line to Formosa in 1896, gradually followed by services to the

various Chinese ports.

The company suffered from the prevailing depression in shipping after the war between Japan and China, but at the end of 1898 had a fleet of 54 steamers, of 40,139 gross tons, averaging less than 800 tons each. With its various services gradually extending, strongly aided by the government subsidy, it soon, however, began to make better progress.

The O. S. K. first came to the Pacific coast of America in 1909. The Chicago, Milwaukee & St. Paul Railroad had built through to the coast in that year and a contract was made by it with the Osaka Company providing for a steamship service from Tacoma

and Seattle to the principal Japanese and Chinese ports.

A similar contract had been made several years earlier between the Great Northern railroad and the Nippon Yusen Kaisha (Japanese Mail Steamship Co.) Both these contracts are still in existence, despite the efforts of the shipping board during the last few months to have them cancelled.

On the strength of this contract the O. S. K. contracted for six cargo steamers of about 8,000 tons deadweight each, to be built in Japanese yards, and the service was begun by the *Tacoma Maru* in 1909. These boats ran successfully for several years, practically without accident, but some of them have since been replaced by larger steamers of 12,000 tons deadweight capacity.

In 1913 the O. S. K. started a regular line to British India and in 1916 a line to the east coast of South America, by way of

the Cape of Good Hope, and also a line to Australia.

It began sending steamers to Europe soon after the outbreak of the war, but its regular European service did not start until the end of 1918 and shortly afterward it began despatching its steamers from New York to the Far Eastern ports, by way of the Suez Canal.

In 1922 the Osaka Shosen Kaisha operated in all forty-four services, including its various Japanese home services, its lines to North and South China, Korea, Formosa, the Dutch East Indies, Australia, Bombay and Calcutta, Europe and South America.

It operated three lines of steamers in the North American trade, the transpacific line from Puget Sound, the New York line and a service from New Orleans, by way of the Panama Canal. Its fleet consisting of one hundred and forty-two steamers of 432,541 tons gross.

But fully to appreciate the great progress which has been made by this company and Japanese shipping in general it is necessary to compare the financial condition of the O. S. K. at the end of 1913 with its latest figures at the end of June last:

	Dec. 31, 1913 Yen.	Ju. 30, 1922. Yen.
Capital (paid-up)	 16,500,000	62,500,000
Debentures	 7,100,000	
Total reserves	 5,514,917	43,433,960
	109 Steamers	142 Steamers
Fleet (tons gross)	 176,913	432,541

During the last nine years the company has paid dividends at the following rates:—

1914	10%	1917	45%	1920	15%
1915	11%	1918	60%	1921	10%
1916	24%	1919	40%	1922	10%

This averaged 25 per cent. annually. But as the increases in its capital since 1913 have practically all been made from the reserves, the net return to the stockholders has averaged over 50 per cent. on their 1913 investment.

Of the present fleet, forty-seven steamers, of 216,447 tons gross, were built since 1916, or, in other words, 57 per cent. of the O. S. K.

boats are less than seven years old and represent the best type of modern freight liners.

Practically all of these steamers were built in Japan, and when it is considered that the cost of these boats at war prices must have been enormous, contracts for new vessels having been placed in Japan during the war as high as 700 yen per gross ton, the fact that the book value of the fleet at the end of June last stood at slightly over 161 yen (\$80.50) per gross ton shows that the company has not neglected its depreciation account while paying its large dividends and accumulating such substantial reserves.

Hit by Slump

The O. S. K. is suffering to-day from the world-wide slump in shipping, and after setting aside for the six months 4 per cent. on the reduced book value of the fleet for insurance, 5 per cent. for repairs and depreciation at the rate of 4 per cent. per annum on the original cost of the fleet, the net balance amounted to 859,732 yen, so that it was necessary to transfer Y.2,000,000 from the dividend equalization fund, in addition to the balance brought forward from the previous half year, to make up the dividend payment.

But when it is considered that the United States shipping board is losing at the rate of \$1,000,000 per week in operating expenses alone, without taking any account of insurance and depreciation, the above figures do not compare unfavorably.

It is also notable that in spite of the wonderful prosperity of the Japanese mercantile fleet, since the outbreak of the war, the Japanese government still continues its subsidy payments, although on a somewhat reduced scale, the O. S. K. reporting the receipt for the six months ending June 30 last of Y.1,132,424 in government navigation bounties, and Y.78,073 in mail transport receipts, being at the rate of about \$1,200,000 annually for the two items.

Huge Assets

The company has liquid assets amounting to Y.29,611,973, consisting of negotiable securities, accounts receivable and cash, and its debts are negligible.

Its semi-annual statement itemizes most clearly its various assets and liabilities, as well as giving in detail its earnings and operating expenses, and contrasts most favorably with the statements of the English companies, in which the value of the fleet and the investments and also the cash and amounts receivable, are so lumped together that even the stockholders themselves have difficulty in finding out what their investment is really worth.

When the strong financial position, efficient modern fleet and complete organization, of this Japanese steamship company is considered it must be admitted that the Osaka Shosen Kaisha is a factor to be reckoned with in the world's carrying trade, and that, with a revival of ocean commerce, it is in a position to obtain even a larger share of business than it to-day controls.

And it also must not be overlooked that the Japanese mercantile marine as a whole has made enormous strides during the last thirty years.

Up to the beginning of the war it was largely stimulated by the government navigation subsidies, as well as by the shipbuilding encouragement act, passed in 1896 and amended in 1910 to cover steel vessels of not less than 1,000 tons gross.

Up to the end of 1916 over Y.15,000,000 (\$7,500,000) had been paid out under this act and 182 vessels of over 700 tons gross, totaling 637,230 tons gross, had been constructed. This bounty was discontinued in 1917, owing to the prosperous condition of the industry, but the shipbuilders are now asking that it be reinstated as, in spite of their cheaper labor, they cannot successfully compete with the better equipment of the British and Continental shipyards.

After the outbreak of the war the immense increase of business across the Pacific and the gradual withdrawal of the British ships, their chief competitors in the trade, gave the Japanese an oppor-

tunity which they were not slow to avail themselves of. During the earlier years of the war the large shipments for Russian account created a great demand for tonnage at rapidly advancing rates, and later on the Turkish attacks on the Suez Canal and the submarine campaign in the Mediterranean diverted much of the Southern Asiatic trade to the Pacific coast.

Since the end of 1918 this trade has largely resumed its former route through the Suez Canal and the Japanese have had to look elsewhere for the employment of part of their largely increased fleet.

Some of the other companies in addition to the O. S. K., have established lines to South America and Europe, as well as to the Eastern Coast of America, and in addition to this many modern Japanese freighters are to be found in the tramp trade of the North Atlantic.

The 1922 Fleet

On June 30, 1922, according to returns issued by Lloyd's Register, the Japanese merchant fleet consisted of 3,325,000 gross tons of seagoing, steel and iron steamers and motor ships and ranked third in the world's mercantile marines, slightly exceeding the French. Of this tonnage 46.1 per cent. was built since 1918, the Japanese possessing a larger percentage of new vessels than any other nation, with the exception of the United States.

And in this connection the figures in regard to the traffic through

the Suez and Panama Canals are most instructive.

In the last year before the war the Japanese tonnage represented 1.7 per cent. of the total tonnage passing through the Suez Canal and exactly the same percentage of the Panama Canal tonnage, while in 1920 it had risen to second place at Panama, representing 9.1 per cent. of the total, and had also increased to 9 per cent. of the total tonnage passing through the Suez Canal.

With their fine modern fleet, well managed, efficiently manned and cheaply run, and their complete business organization covering the principal ports of the world, there can be no question but that the Japanese are in a position to successfully compete for an in-

creasing share of the world's carrying trade.

A French Resurrection

THE resurrection of the Banque Industrielle de Chine is now pretty well assured, the senate having followed the example of the chamber in approving the governmental project for application of the boxer indemnity instalments still due to France to the purpose of paying off its bad debts. These instalments are reckoned at 225,000,000 francs gold, or 562,000,000 francs paper. From this sum 13,000,000 francs gold are to be taken to finance Franco-Chinese educative enterprises, and also 10,000,000 to pay up the shares taken by the Chinese government in the bank but not called, this being really the price of Peking's consent to the scheme. The rest of the money will be used to reimburse creditors of the bank. It is believed it will suffice, and will even leave something over.

According to the latest figures the bank's liabilities amount to 972 million francs paper, as follows:—

Bank of France and consortium of banks in

 aid of B.I.C.
 ...
 ...
 ...
 237,000,000

 Creditors in Far East
 ...
 ...
 ...
 474,000,000

 Other creditors
 ...
 ...
 ...
 210,000,000

As for the assets, they are put at about 500,000,000 francs. A sum of 50,000,000 francs out of these assets has been placed at the disposal of the Company administering the affairs of the bank as working capital. Incidentally, it is stated that out of the 68,000,000 francs due by shareholders (including the Chinese government) on unpaid-up capital, only 12,000,000 has been received to date. It remains to be seen whether the balance will ever be paid,

but meantime, thanks to the boxer indemnity, the 500 franc shares are quoted as high as 200.

The unhappy affair, which began two years ago with the closing of the doors of the B.I.C. and has been dragging through the courts and through parliament ever since, thus seems to be drawing to a more or less satisfactory close, with the French reputation in China salved at the expense of the French taxpayer, with Pernotte, the former director and leading spirit of the whole enterprise, in prison, and with the prospect of a new B.I.C. under the control of the French government, but with a one-third Chinese participation, rising out of the ashes of the old one.

Sinclair Sakhalien Interest Protected

IN the opinion of officials of the American government, the Sinclair oil interests in Sakhalien will be fully protected. The Japanese government, it was declared, will throw no obstacle in the way of the Sinclair company in exploitation of the Sakhalien oil fields.

John Hays Hammond, who has made an investigation of that district and knows its oil possibilities, and recently mentioned as ambassador to Japan, believes the Japanese government will give every consideration to development of the resources of Sakhalien. While skeptical of oil possibilities there, he declared the Sinclair interests are evidently willing to invest a considerable sum in exploitation of the fields.

"The section in which the Sinclair interests are located," said Mr. Hammond, "has been investigated before, and oil possibilities were not alluring. I am not trying to discredit reports there are valuable deposits there, but surveys made in the past did not disclose remarable potentialities."

Mr. Hammond also exploded another theory of Chinese coal producing possibilities, and asserted they are not so extensive as has been thought. He denied China could supply the world with coal for years and added it could furnish only enough for Japanese and Chinese consumption.

"Japan," Mr. Hammond said, "Should be permitted to exploit the coal and iron possibilities of China, Mongolia and the Far

East republic."

FOR A GREATER TOKYO

(Continued from page 273)

representative of all Japanese cities and towns of more than 10,000 inhabitants. This association should hold an annual convention; it should have able officers and a powerful executive committee. It should prepare drafts of laws and ordinances for presentation to the imperial government. It should have able representatives to speak for the cities and towns before the committees of the imperial diet. Such an association would be great force in the advancement of self-government and home rule for, Japanese cities and towns. No cabinet, one matter how powerful could utterly disregard its suggestions and recommendations.

The grand conclusion must be therefore that the key to the creation of a splendid capital in Tokyo lies in the hands of the imperial government. If the city to be made worthy of the empire, then the imperial government must ither establish a powerful consolidated government for Greater Tokyo or it must itself assume direct responsibility for planning and building the new capital.

Such are the conclusions to which I have been led by an in-

dependent examination into the local situation.

They are based upon a long study of the experience of London, Paris, Berlin, and New York in their attempts to solve the pressing problems of administration inevitably presented by a great city. The details supporting my general conclusions are to be found in my report.

A Super-Power Zone in Japan

The Program of the Daido Electric Power Company, Ltd.

EADING a combination of fourteen associated power companies and thirteen power consuming enterprises with a capital exceeding Y.370,000,000 (Y.176,000,000 paid up), the Daido Electric Power Company has embarked upon the gigantic task of creating a super-

power zone in the most intense manufacturing district of Japan. Taking Mount Ontake, 75 miles northeast from Nagoya, in the heart of the Japanese Alps, as a centre of distribution, a circle of 75 miles radius embraces the central portion of the main island and includes all the important rivers and basins capable of hydroelectric development. The territory within the circle embraces the principal power markets of Japan, while a circle with 150 miles radius includes all the great manufacturing districts. On the east is Tokyo, Yokohama and their surrounding districts: to the south, Nagoya, Hamamatsu, Yokkaichi, Gifu, Toyohashi, Shidzuoka, Nara and their environs and on the west, Osaka, "the Manchester of Japan," Kyoto, Kobe, and their sub-districts. Within this circle, it may be said, lies the great manufacturing centres of Japan, in which, as time passes, the industrial development of the empire must be accommodated.

In the centre of this circle, the heart of Japan, are many rivers of sharp gradient having their sources in the numerous small

mountain lakes fed by the snows of the Japanese Alps and an abundant rainfall. It is here that Japan must seek the solution to the ever pressing problem of fuel and rising costs of labor. To

develop these great resources of national wealth and enable Japanese industries to compete successfully in the markets of the world, the Daido Electric Power Company together with its associated companies, has entered into a construction program which calls for an increase of 82,080 kilowatts to their present output of 42,110 k.w. and 119,200 k.w. under actual construction. These plants will furnish power over a gigantic network of transmission lines covering the middle western part of Japan and deliver current to Osaka over 212 miles of 154,000 volt lines. Similar lines will be extended to Tokyo, and when completed,



Mr. M. Fukuzawa,
President of the Daido
Electric Power Co., Ltd.

the entire transmission system will approximate 1,100 miles in length and located so as to be available for the electrification of the state railways.

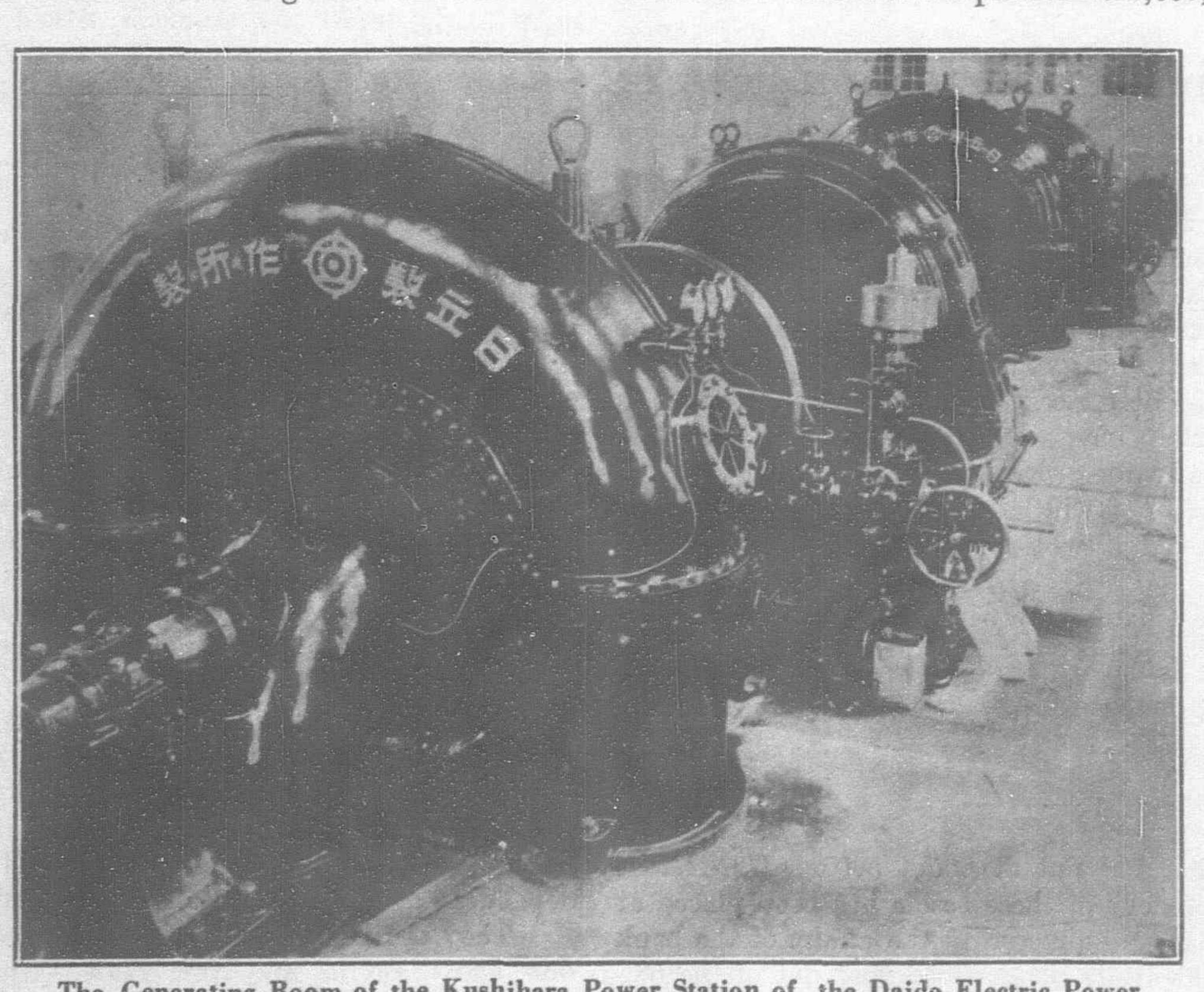
One of the interesting features of this development scheme is the part taken by American manufacturers of electrical machinery

in furnishing the equipment for the Daido plants. Most of the equipment installed in the power plants, substations and transmission lines, including water turbines, generators, switchboards, transmission towers, insulators and other machinery are of American manufacture. To date, the foreign machinery and equipment used in the Daido construction work amounts in value to over Y.14,000,000, of which, 90 per cent. is from America. The policy of the company is to co-operate as far as possible with American capital and to reciprocate in the purchase of American equipment. As will be noted in the list of equipment of the various power stations belonging to the company, the main turbines and generators have been supplied in large part by American manufacturers with a liberal patronage to home and European concerns.

As this combination ranks as one of the largest corporations of its kind in the world, the following outline of its program will convey some idea of the magnitude of its operations and the prospects for an enlarged market for electrical machinery manufacturers.

The present Daido Electric Power Company is the result of a combination of the Kiso Electrical and Industrial Company established in 1918 with a capital of Y.18,600,000, the Osaka Transmis-

sion Company established in 1919 with a capital of Y.20,000,000, and the Nippon Hydraulic Company established in 1919 with a capital of Y.50,000,000. Mr. Fukuzawa, now president of the Daido, was president of the first two companies, and Mr. Yamamoto, now a director of the Daido, president of the last named company. The purpose of all these companies was to transmit power to Osaka, Kyoto and their surrounding districtsone from the Kiso River and the other from the northern part of the country. For the purpose of bringing about a desirable adjustment of their various competing activities these men, together with other pro-



The Generating Room of the Kushihara Power Station of the Daido Electric Power Company, Ltd. Equipped with two Hidachi, 5,500 h.p. (max.) double spiral, double discharge horizontal shaft water turbines and two Hidachi 3,750 K.V.A. alternators, 80%. P.F., 6.600 v., 3 phase, 60 cycles, 514 r.p.m.

minent capitalists, came together and in November, 1920, decided to establish a limited corporation under the name of the Daido Electric Power Company, Limited. The head office was located at Tokyo with branches at Nagoya and Osaka and the following directorate elected: President, Momosuke Fukuzawa: Vice-President, K. Miyazaki; Managing Directors, J. Masuda, K. Ota, S. Mine, S. Kondo and H. Sekiguchi; Auditor, C. Asano; General Manager and Director, S. Murase; Assistant Manager, S. Moroh.

The company is capitalized as follows:

	Yen.
Authorized Capital, Par Value Y.50	100,000,000
Capital Paid-up:	
Preferred Stock, 372,000 shares @ Y.30	11,160,000
Class "A" Common Stock, 120,000 shares	
@ Y.25	3,000,000
Class "B" Common Stock, 1,508,000 shares	
@ Y.20	30,160,000

Total Yen 44,320,000

There is outstanding Y.29,140,064 of 7 per cent. debentures. After paying interest on the debentures in May, 1922 there was paid 6.4 per cent. dividend on the common and preferred stocks and 6 per cent. additional dividend on the preferred stock.

Relation Between the Daido and the Toho Electric Power Company

The relations between these two companies have been very close since their establishment and at the formation of the Daido in 1920 a mutual arrangement was made whereby the Daido undertook the duty of power development and transmission and the Toho to act as the distributing agent in direct control of the demands of consumers. The relation between the two companies goes back to the foundation of the Kiso Electric Power and Steel Company which developed in 1918 with a capital of Y.17,000,000 from the Nagoya Electric Light Company, the predecessor of the present Toho Electric Power Company. The Kiso Electric Power and Steel Company was later renamed the Kiso Electrical and Industrial Company, and in 1920 the Daido was formed by combining this organization with two other companies. The distribution of the stock of the Daido held by the Toho and its stockholders is as follows: Shares held by the Toho, 529,150: Shares held by its stockholders, 632,440: Total, 1,161,590, or, more than one-half of 2,000,000 total shares are at present held by the Toho Electric Power Company and its shareholders.

Associated Companies

The distinctive feature of the Daido is the union of capital combining all associated companies which possess available sites for hydro-electric power development in well located positions in relation to the power market. In addition to the financial combination, the company forms a ring of interlocking corporations connecting with manufacturing and industrial enterprises, the importance of which will be gathered from the following properties under the managing control of Mr. Fukuzawa which form the combination.

ASSOCIATED PO	WER	PRODUCING	COMPANIES	
Name of Company		Location	Authorized Capital Yen.	Capital Paid-up Yen.
Toho Electric Power Co	***	Tokyo	139,821,200	99,994,235
Hakusan Water Power Co		23	10,000,000	2,500,000
Nom Electric Co		Nagoya	3,000,000	750,000
Bisan Electric Power Co	***	***	5,000,000	1,250,000
Lahagi Water Power Co.		99	5,750,000	3,450,000
Fukul Electric Power Co.		Fukui	500,000	125,000
lateyama Water Power Co.		Toyama	2,000,000	1,500,000
HOKUFIKU Transmission Co	***	***	2,000,000	500,000
Tenryugawa Electric Power Co		Hamamatsu	50,000,000	500,000
Mill Electric Power Co.		Tokyo	5,000,000	1,250,000
Manshin Electric Co.		Nagano	1,000,000	500,000
nameoka Water Power Co		,,,	5,000,000	1,250,000
Vshirakawa Water Power Co.		.,	2,000,000	500,000
Nagaragawa Water Power Co.	•••	Gifu	1,000,000	250,000
			232.071.200	114.319.235

			R USING C		
Name of Compan	y		Location	Authorized Capital Yen.	Capital Paid-up Yen.
Daido Fertilizing Co.	***		Fukui	3,000,000	2,520,000
Daido Steel Works	***		Nagoya	1,000,000	1,000,000
Electric Steel Works			Tokyo	2,788,000	1,644,000
Hokoku Cement Co.	•••		Nagoya	7,500,000	4,700,000
Nagoya Refrigerating Co.			99	150,000	150,000
Kitayena Railway Co.	***	***	22	2,000,000	200,000
Tokai Soda Mfg. Co	***	***	27	1,250,000	662,500
Aichi Electric Railway Co			99	15,162,500	4,675,000
Tokai Electrode Mfg. Co.		***	Tokyo	1,000,000	525,000
Yahagi Cableway Co.	***	***	Gifu	250,000	125,000
Yahagi Reclaiming Co.	***	***	99	500,000	250,000
Nagoya Warehouse Co.	***		Nagoya	3,600,000	900,000
Togen Industrial Co.	•••	•••	29	320,000	320,000
				V 39 590 500 V	17 671 500

Y.38,520,500 Y.17,671,500

Briefly the total capital of this great combination exceeds Y.370,000,000 and the amount paid up is over Y.176,000,000.

Supply and Demand of Power in Central Japau

On the mainland of Japan there are 31 prefectures, including 15 large cities and about 200 towns. From the point of view of supply and demand of power, it may be divided into the following three divisions: I, Tokyo, Yokohama and their surrounding districts; II, Nagoya and locality; III, Osaka, Kobe, Kyoto and their surrounding districts.

It is estimated that these three divisions will require approximately 70 per cent. of the total power demand on the mainland. A statement as to the supply of power to these districts up to June, 1922 is:

,,		155,000 k.w.		465,000 k.w.
59		130,000 ,,	50,000 ,,	180,000 ,,
	TT	10,000 ,,	60,000 .,	70,000 ,,
Division	ıI	 15,000 k.w.		215,000 k.w.
		Steam Powe	er Water Power	Total Present Supply

According to the statistical report of the government since 1911 the annual rate of power demand in these three divisions is as follows: I, 20,000 k.w.; II, 10,000; III, 20,000; Total, 50,000 k.w.

With the above ratio of annual increase of power demand, total requirements for each division at the end of five years and ten years would be as follows:

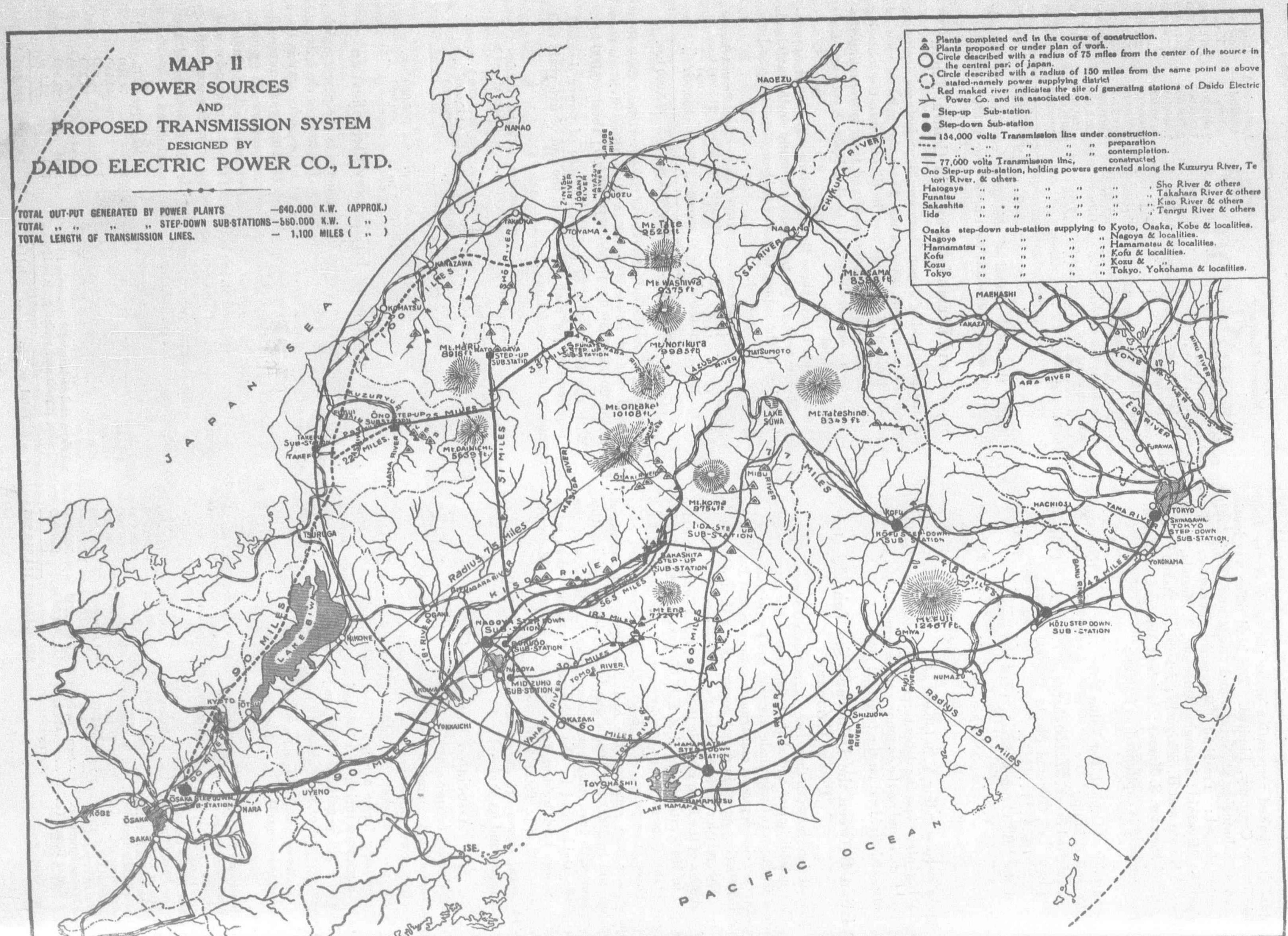
	Present Supply	Total Require- ments after 5 Years	Total Require- ments after 10 Years
	215,000 k.w. 70,000 ,, 180,000 ,,	315,000 k.w. 120,000 ,, 280,000 .,	415,000 k.w. 170,000 ,, 380,000 ,,
Total Require-		715,000 k.w. 250,000 .,	965,000 k.w. 500,000

Power Requirements for Railway Electrification

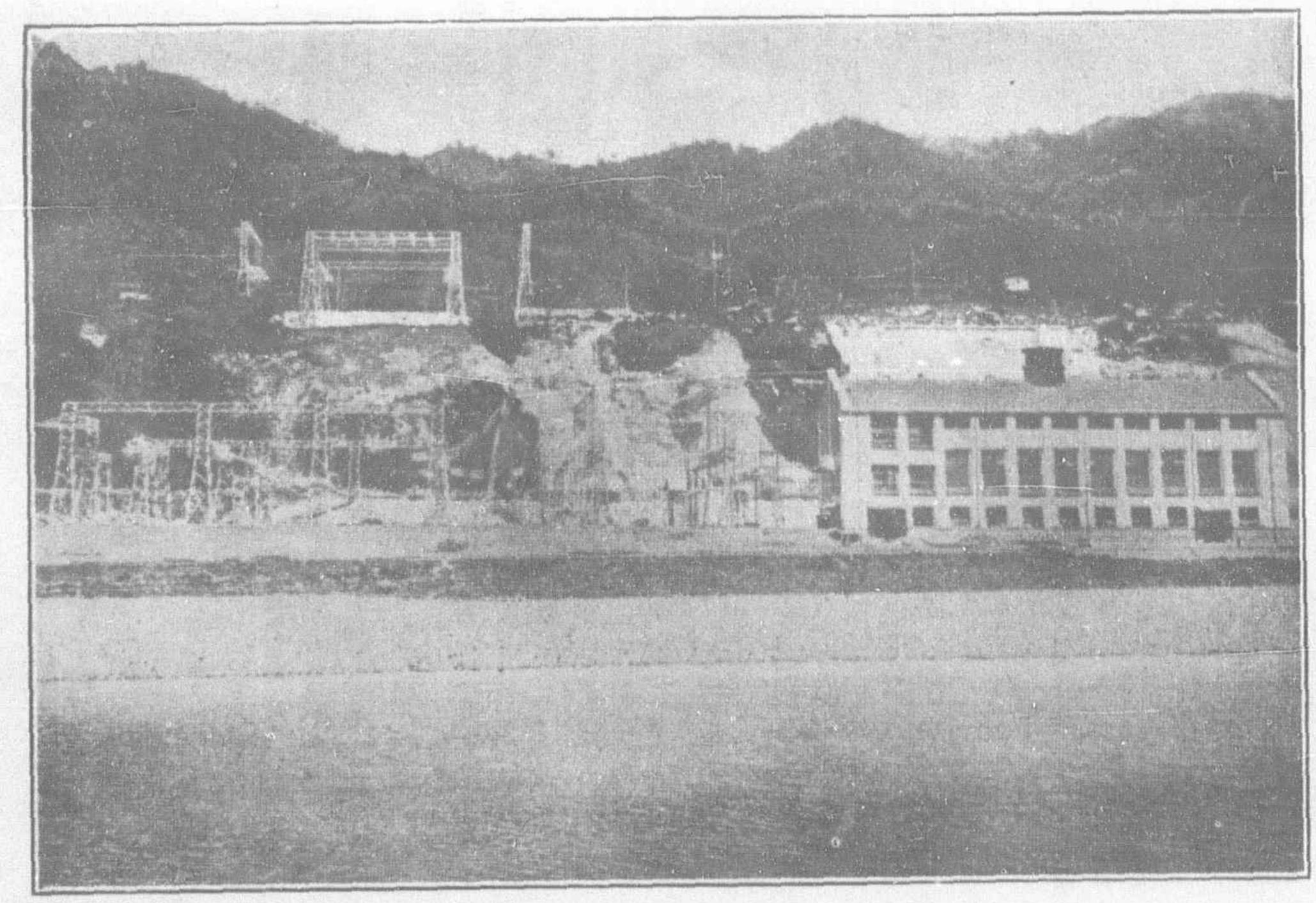
A very important matter to be considered is the power which will be required for railway electrification. The work of electrifying the imperial government lines is expected to be under way in the very near future. It is a question whether the supply of power will be furnished by existing public service corporations or by new generating system to be built by the government. The Daido's program, however, is based on the belief that the final conclusion will result in the purchase of power from existing operating companies.

The estimated power requirements for electrification of the various railroad sections in Central Japan are as follows:

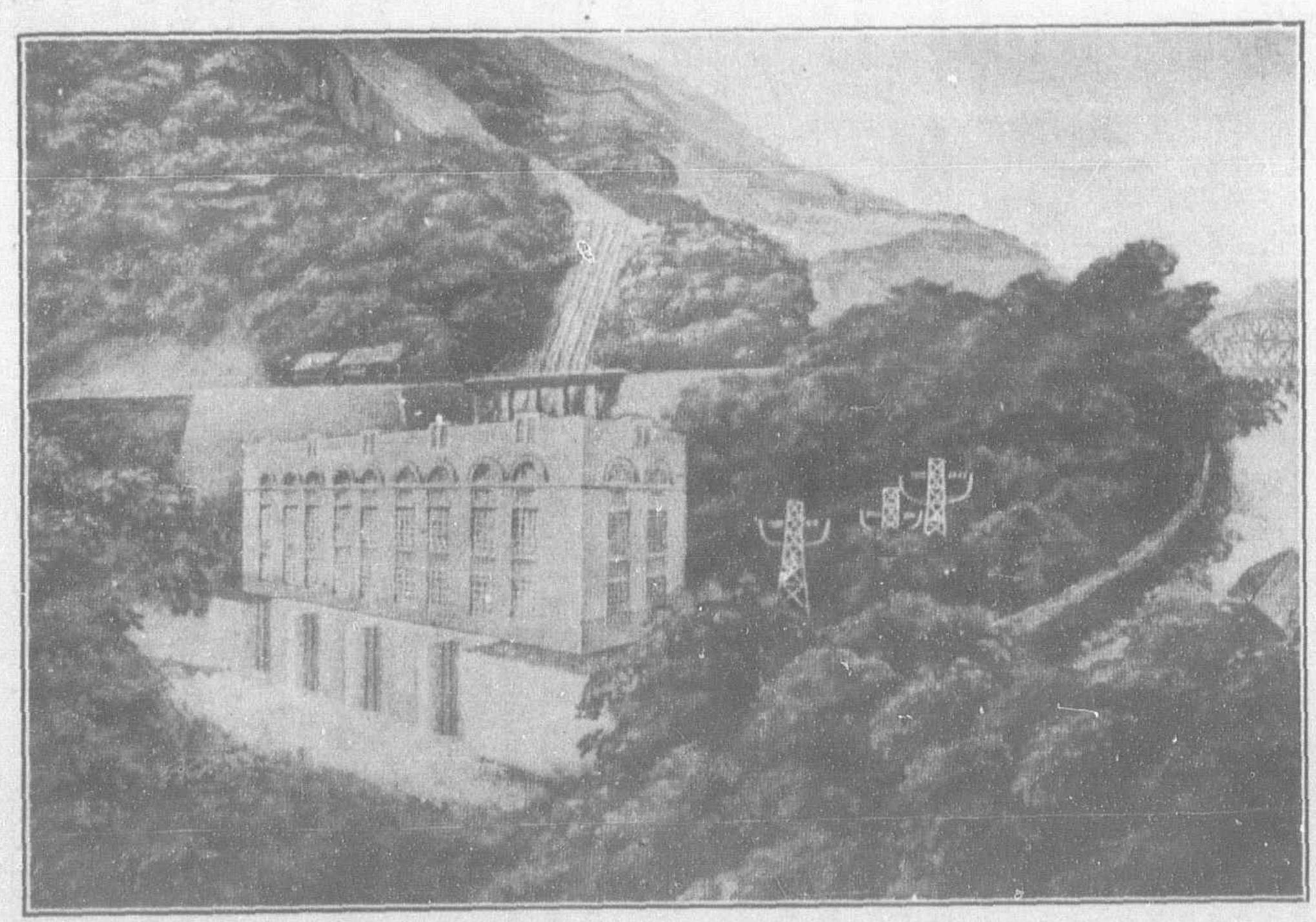
				Miles	K.W. per Mile	Power Required	
Tokaido	Lines		***	374	200	74,800	
Chuwo	"			301	150	45,150	
Hokuriku	**			228	150	34,200	
Kansai	99		***	119	150	13,350	
Sangu	**	***		45	150	6,750	
Tokyo and	l vicini	ity	***	197	150	29,550	
Osaka, Ky	roto an	d viei	inity	150	150	22,500	
Tot	al			1,414		226,300	



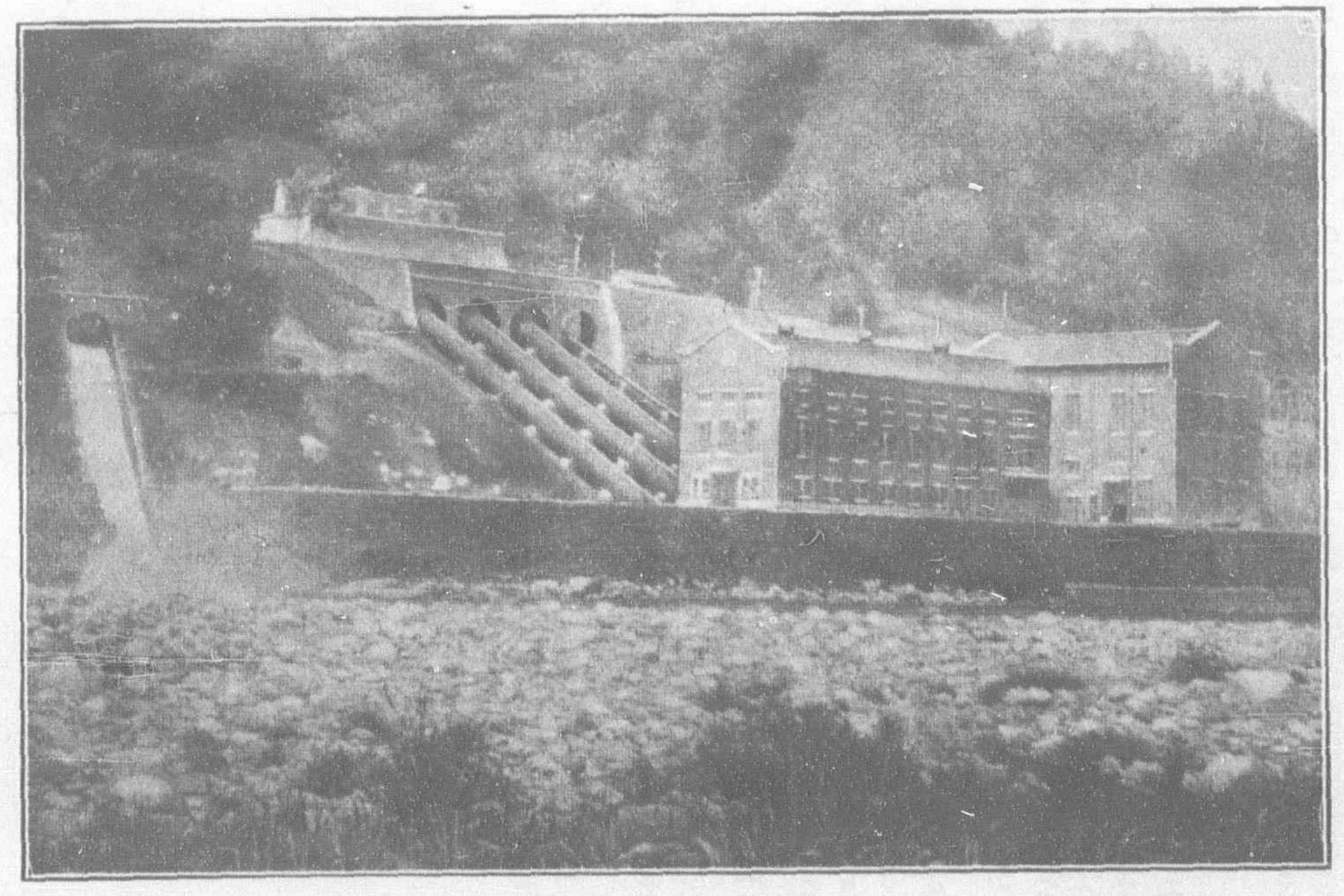
POWER HOUSES OF THE DAIDO ELECTRIC POWER



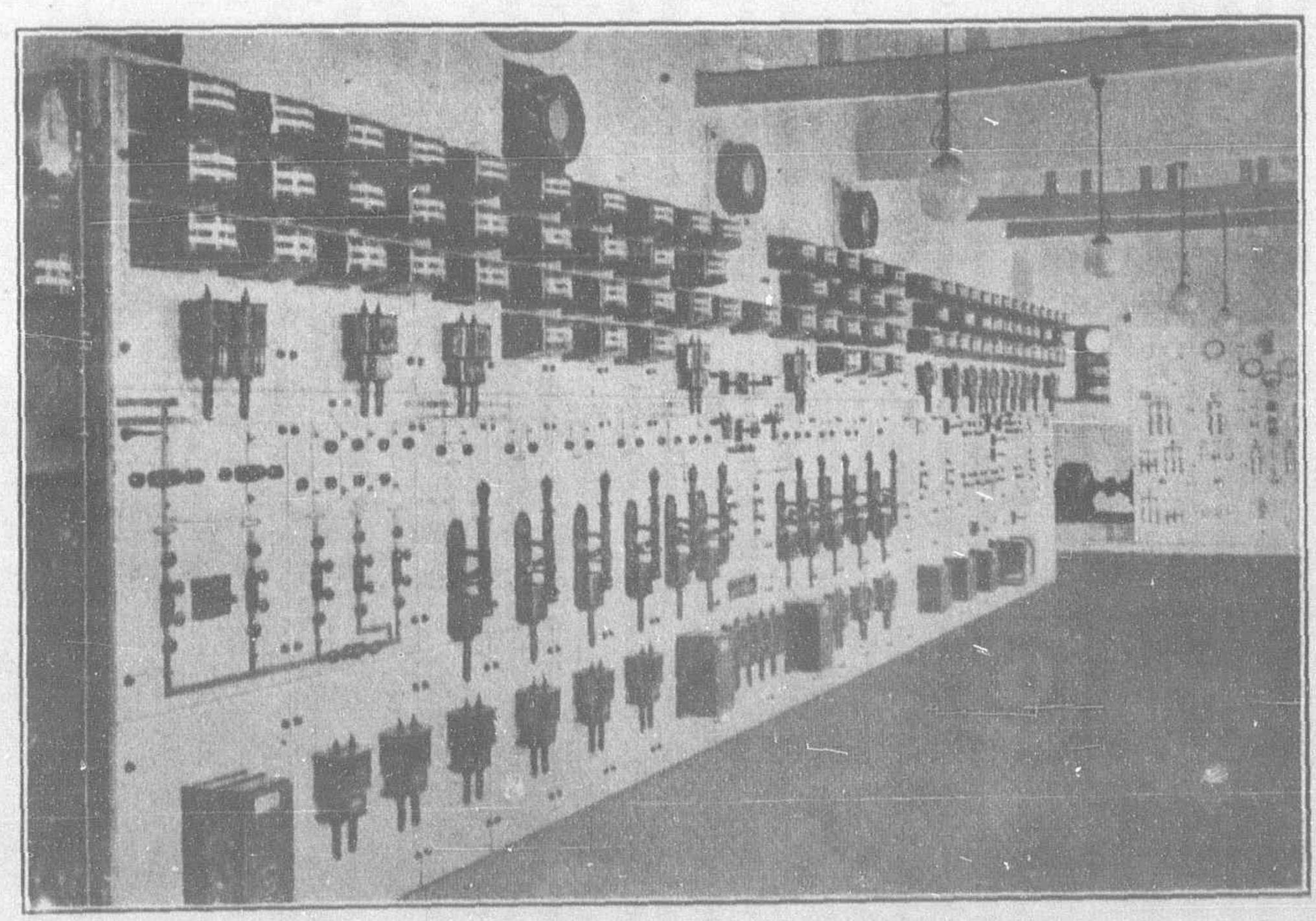
Suhara Power House in Operation and Sub-Station under Construction



Yomikaki Power House as it will appear when completed



Okuwa Power House



Switchboard, Rokugo Sub-Station: Made by the Shibaura Engineering Works of Tokyo

It is expected that electrification of the railroads will be completed in approximately ten years, and in estimating the probable demand, consideration is given to the probable increase of transportation on all lines. These figures show the great importance to the country of the development of hydro-electric power particularly in the central portion, the industrial heart of the country.

Estimated Water Power in Central Japan

According to the investigation of the hydraulic bureau of the government, the total estimated value of the water power in the whole of Japan is approximately 10,000,000 k.w. of which 7,000,000 k.w. is to be found on the mainland of the country and may be classified as follows: Economically applicable, 5,500,000 k.w.;

economically inapplicable, 1,500,000.

The rivers running through the central portion of Japan, which available for their electrification. are commercially practicable for the development of long distance transmission and have a combined capacity of 4,550,000 k.w. are listed with their estimated capacities as follows: Abukuma, 200,000; Tone, 500,000; Sagami, 150,000; Sakai, 70,000; Fuji, 150,000; Ohi, 150,000; Akano, 500,000; Shinano, 750,000; Arakawa, 60,000; Hime, 100,000; Tenryu, 300,000; Yahagi, 70,000; Kiso, 500,000; Kurobe, 200,000; Jintsu, 250,000; Shokawa, 150,000; Tetori, 100,000; Kuzuryu, 100,000; Kumano, 120,000; Yodo, 130,000; Hida, 70,000; Others, 30,000; Total, 4,650,000 k.w.

Of the above rivers, the last named eleven are considered to have the most economical sites for power development. Their aggregate capacity is 2,900,000 k.w. Of these eleven rivers all except the Kurobe, Kumano and Yodo are either under operation or in some stage of development. The aggregate capacity which is under the control of the Daido and its associated companies as shown by the

following table is over 1,000,000 k.w.:-

Name of Companies		Power in Op- eration	Power under Con- struction	Power under Plan of Work	Total	Power under Applica- tion	Grand Total
		K.W.	K.W.	K.W.	K.W.	K.W.	K.W.
Daido		48,100	119,200	82,080	249,380	264,042	513,422
Toho		37,769	3,772	44,745	86,286	162,235	248,521
Yahagi		8,050	5,000	8,000	21,050	40,000	61,050
Bisan		1,431	6,513	6,912	14,856	2,348	17,204
Nöhi		144	3,950	1,170	5,264	55,166	60,430
Hakusan	***		32,000	14,982	46,982	45,565	92,547
Gifu	***		6,000	57,560	63,560		63,560
Tenryugawa	•••					143,303	143,303
Total	•••	95,494	176,435	215,449	487,378	712,659	1,200,037

Power Plants and Capacities

A summary of the power plants now operated by the Daido together with those under construction and in other stage of development is given below.

1 Power Plants in Operation. -- Shizumo, 14,700 k.w.; Okuwa, 11,000; Kushihara, 6,000; Nishikadohara, 7,200; Suhara, 9,200; Total, 48,100 k.w.

- 2 Power Plants under Construction.—Kema (Steam), 12,500 k.w.; Yomikaki, 40,700; Ohi, 42,900; Momoyama, 23,100; Total, 119.200 k.w.
- 3 Power Plants Contemplated .- Nezame, 7,300 k.w.; Ochiai, 13,700; Kasagi, 17,000; Nishikitsu, 18,000; Imawatari No. 1, 8,490; Imawatari No. 2, 3,990; Hanafusa, 10,000; Higashikadohara, 1,300; Shimouchinami, 2,300; Total, 82,080 k.w.

Transmission Lines

The proposed plan is to have a gigantic network of transmission

lines covering the middle western part of Japan.

- 1 Completed and in Operation: 163 miles of 77,000 volt line of which 100 miles has steel tower construction, and 63 miles wooden poles from power plants along the Kiso and Yahagi rivers to Nagoya. 90 miles of 154,000 volt line, steel tower construction, from Kiyosu to Osaka. 30 miles of 66,000 volt line from power plants along the Kuzuryu river to Takefu.
- 2 Under Construction: 76 miles of 77,000 volt line, steel tower construction, from power plants along the Kuzuryu river to Nagoya,

to be completed by April, 1923. 65 miles of 154,000 volt line, steel tower construction, from Suhara power plant on the Kiso river to Kiyosu, to be completed by August, 1923.

3 Under Preparation: 212 miles of 154,000 volt line, steel tower construction, from Hokuriku to Osaka, to be known as Hokuriku transmission trunk line. 70 miles of 77,000 volt line, steel tower construction, from the Jintsu river power site to Nagoya. 51 miles of 55,000 volt line, steel tower construction, from Osaka to Wakayama. 35 miles of 77,000 volt line, steel tower construction, connecting power plants between the Seki and Kiso river.

There are also plans covering the transmission of power to Tokyo, and in general, the main transmission system will, when completed, extend for approximately 1,110 miles, and be so advantageously located along the government railways that it will be

Hydro-Electric Power Development on the Kiso River

The power plants of the Daido situated along the whole course of the Kiso river are as follows:--

Plants		Volume cu. ft.	Head ft.	Capacity K.W.	Water Way	System
Nezame .		1,100	110.0	7,300	2.8	Canal
Momoyama .		1,300	267.0	23,100	2.7	22
Carbana		1,200	115.0	9,200	2.0	23
Okuwa .		1,300	129.0	11,000	2.6	22
Yomikaki .		1,600	370.0	40,700	6.7	**
Shizumo .		1,300	153.0	12,600	3.0	22
" Extens	ion	200	165.0	2,100		57
Ochici		1,600	130.0	13,700	4.7	,,
Ohi		4,500	140.0	42,900		Dam
Kanda		4,500	117.0	33,600		22
Futamata .		3,500	114.0	25,500		29
Maruyama .		3,500	119.0	26,600		,,
Imawatari No	.1	2,000	63.0	8,490	2.0	Canal
" No	.2	2,000	30.0	3,990	1.9	22

Total Capacity ... 260,780 K.W.

Of the total power to be developed on the Kiso river, 34,900 k.w. is now in operation, 110,700 k.w. under construction, and 118,540 k.w. under contemplation. Besides 6,000 k.w. on the Yahagi and 7,200 k.w. on the Kuzuryu are now in operation. According to the power hydrograph of the Kiso river, approximately 545,000,000 k.w.h. of minimum power and 985,000,000 k.w.h. of maximum power will be produced annually at the sites located on the stream above the Shizumo power house. It is estimated that the total construction cost for these power plants on the Kiso river from Nezame to Ohi will amount to approximately Y.48,700,000 and the average cost per kilowatt Y.315.

Ohi Power Plant-Dam System

The Ohi plant is intended to undertake the supply of power for peak load of Osaka sub-station, thus keeping the load of other plants such as Momoyama, Suhara, Okuwa and Yomikaki nearly constant. This base load will amount to approximately 100,000 k.w.

The load factor for Ohi plant will be certainly below 50 per cent. but the average load factor for all plants running together in parallel is estimated to be about 75 per cent. as the other plants with the exception of Ohi will have naturally very good figures due to the nature of their loads.

The present work of the Daido is in the primary stage. The secondary period of power development on the Kiso and its tributaries will begin in the near future, and upon its completion most of the power produced will be taken for base load at the Ohi plant.

Otaki Reservoir

The rivers having their sources in the plateau of the "Japan Alps" are usually low in run-off during the two winter months of January and February. The principal purpose of Otaki reservoir is to supply water during this dry season, and to regulate the discharge at other times.

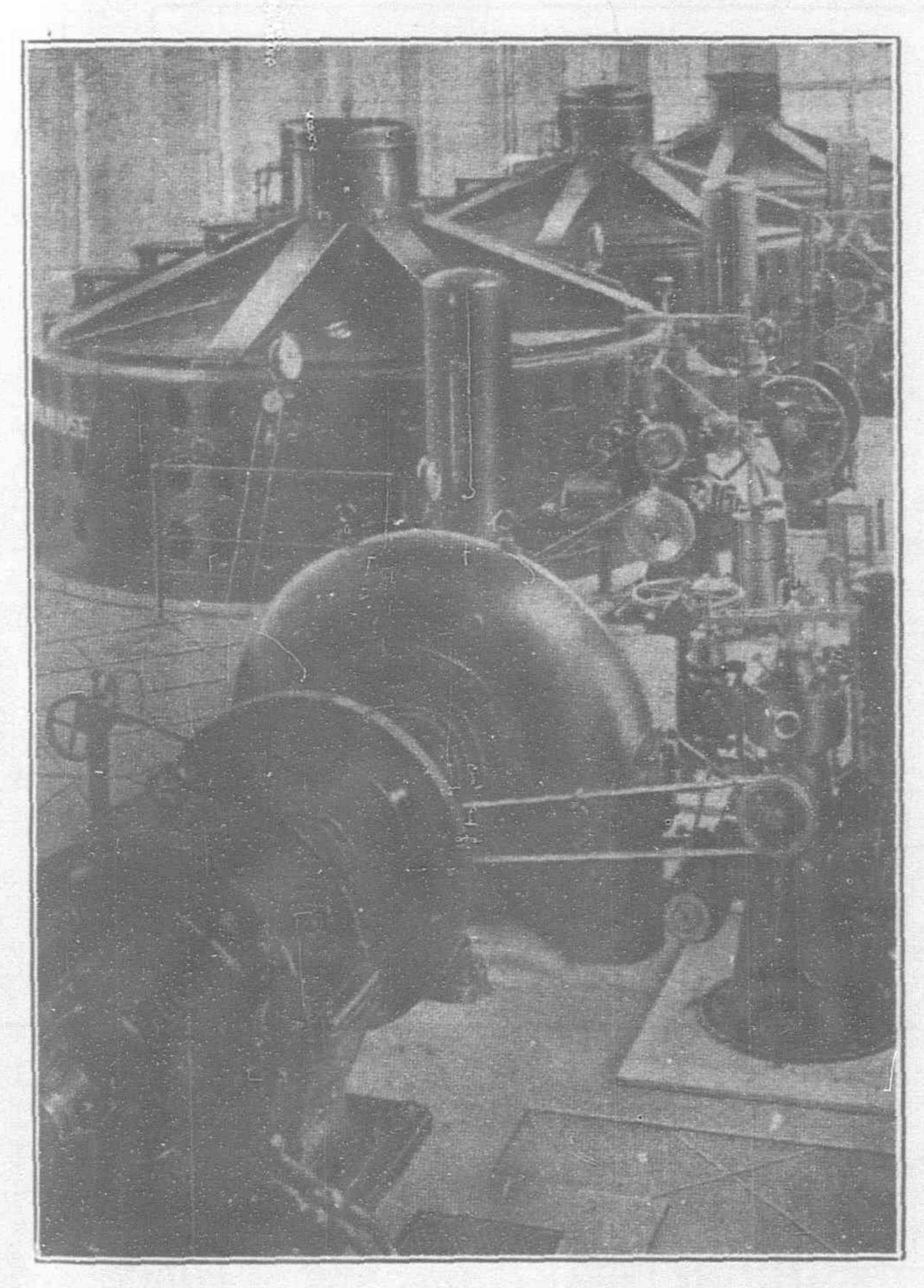
The reservoir is to be constructed by a dam wall 300 feet high and the capacity will be 3,200,000,000 cubic feet. The regulated flow from this reservoir will produce an additional 320,000,000 k.w.h. during the dry season, and upon completion of the whole power development on the Kiso river, the total capacity of 823,000,-000 k.w.h. It is expected that the reservoir will be completed by the end of 1924.

Proposed Scheme of Power Development on the Tenryu River

There are ten sites along the Tenryu river suitable for power development and their total capacity is approximately 250,000 k.w. Data on these sites are as follows:

Sites		Volume	Head	Capacity	Water Wa	ay System
		cu. ft.	ft.	K.W.	mile	
No. I	***	1,200	37.5	2,832	0.5	Canal System
No. II		1,300	46.0	3,763	2.2	22
No. III	***	1,360	251.0	21,324	6.4	***
No. IV	***	1,700	215.0	23,000	7.5	,,
No. V	***	1,900	51.0	6,058	2.4	,,
No. VI	***	3,500	140.0	30,837	1.1	Dam System
No. VI	[3,700	72.0	16,765		,,
No. VI	II	4,000	100.0	25,551		
Otami		4,310	140.0	41,150		,,
Sakuma	1	4,780	250.0	85.500		23
To	tal car	pacity		252,780 K	.w.	

At the upper end of the Tenryu river, Lake Suwa, having a catchment area of over 208 square miles, forms a natural storage



Okuwa Power House of the Daido Electric Power Co., Ltd. Equipped with three 5,800 h.p. (max.) 277 r.p.m. single spiral, single discharge Allis-Chalmers water turbines and three 5,000 k.v.a., 80% P.F., 6,000 v. 3 phase, 60 cycles, Westinghouse alternators.

reservoir. For about 40 miles from Tokimata to Futamata the river flows through the great Tenryu canyon, a place of grand scenic beauty, bordered on either side by ranges of steeply rising hills and providing sites most suitable for dam construction.

The company is now rapidly carrying out the work of surveying, locating, etc. This river is in striking contrast to many others in that the volume of water is so constant that the minimum run-off for eleven months can be taken as the basis for power development, and no provision for steam power plants for emergency use is necessary. If, however, a steam reserve is provided and the design changed to

the eight months minimum run-off, a total capacity of 400,000 k.w. can be obtained with a total construction cost of Y.300 per kilowatt.

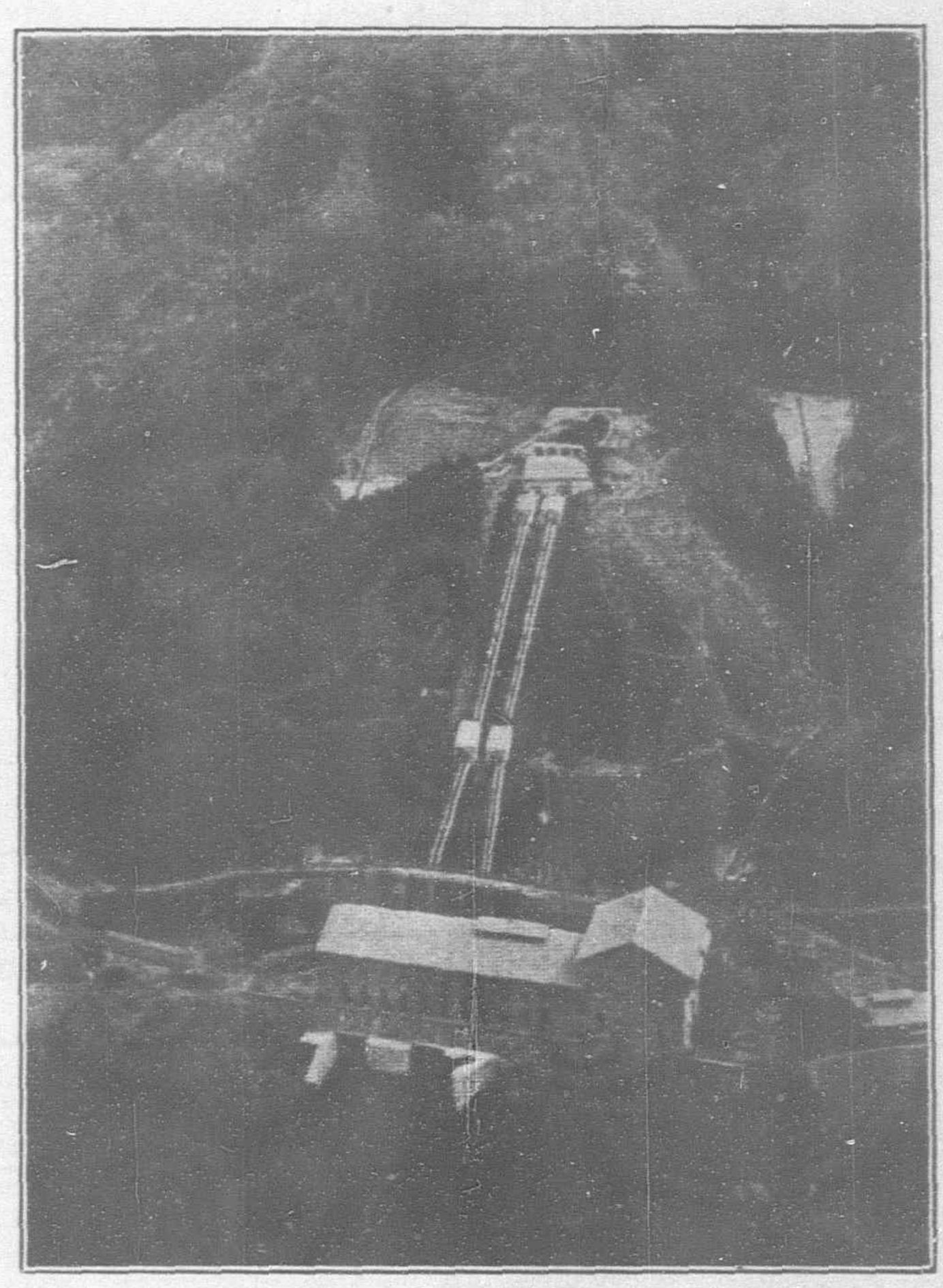
It is estimated that total construction cost for these ten power plants will amount to approximately Y.87,000,000 or Y.344 per kilowatt. The Tenryu river is undoubtedly one of the finest rivers for power development in Japan.

Principal Power Market

One of the most important considerations involved in the sale of power is location. Fortunately the source of hydro-electric power in the central portion of Japan is easily within reach of Tokyo, Yokohama, Nagoya, Kyoto, Kobe and Osaka, the principal power markets of the country. The following illustrations show the importance of the Daido's position as a supplying company with reference to the most intensive manufacturing centres of the country. The principal consumers are as follows:

1. The Toho Electric Power Co. with Nagoya as the principal centre and extending to Toyohashi, Gifu, Hamamatsu, Okazaki, Yokkaichi, and Nara in the central district.

2. The Osaka Electric Light Co. dealing in light and power, and other urban and interurban traction companies, and industrial companies located in and near the city of Osaka.



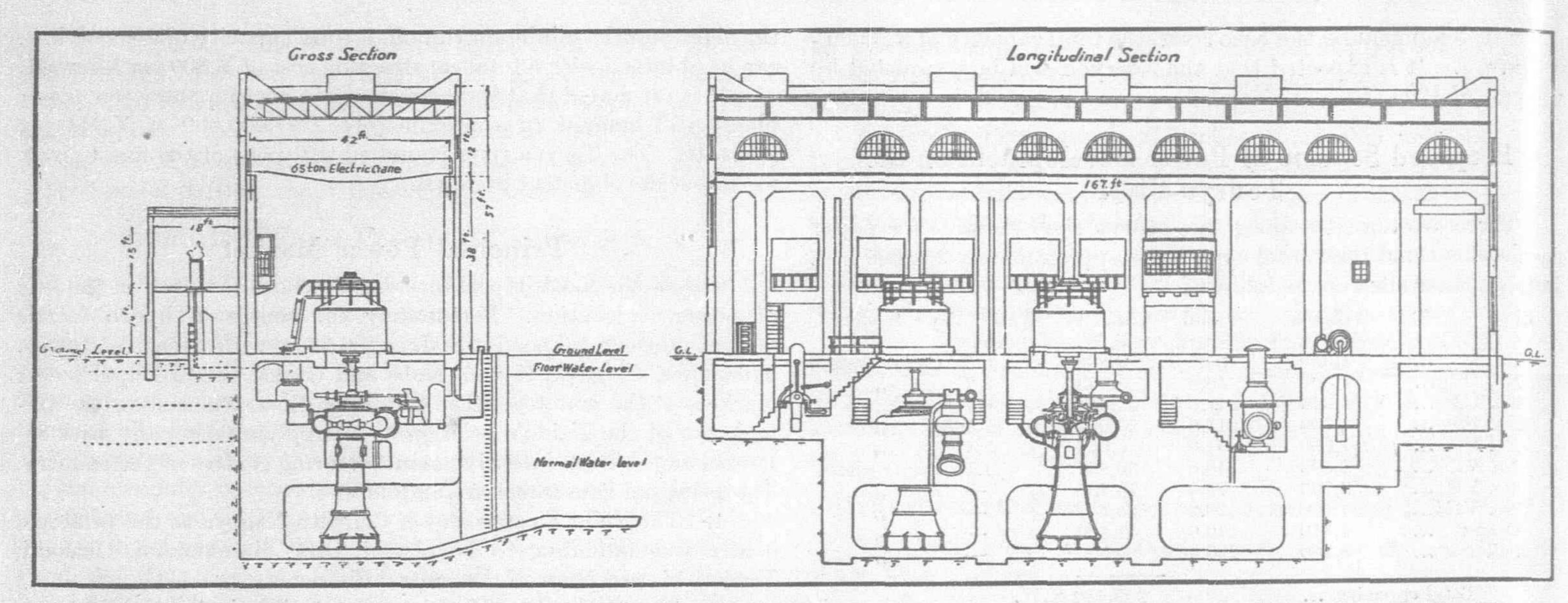
Kushihara Power House of the Daido Electric Power Co., Ltd.

3. The Kyoto Electric Light Co. which is supplying light and power in the city of Kyoto and the neighboring district, and also in the prefecture of Fukui.

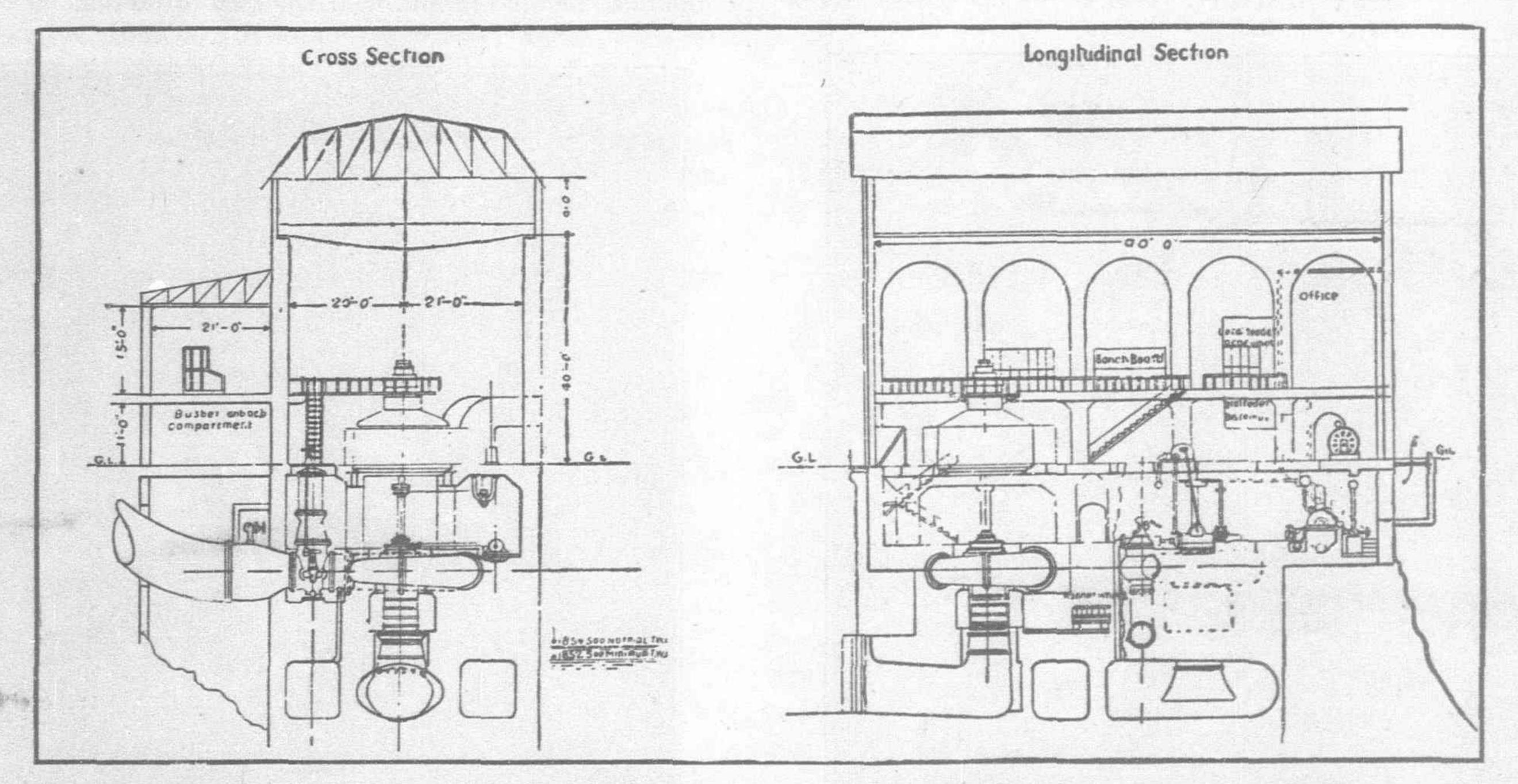
4. The Keihan Electric Traction Co. which carries on a traction business and also supplies light and power, and other industrial companies located in Kyoto, Osaka and their surrounding districts.

5. The municipal government of Kobe, Kawasaki Dockyard, and other industrial companies located in Kobe and its environs.

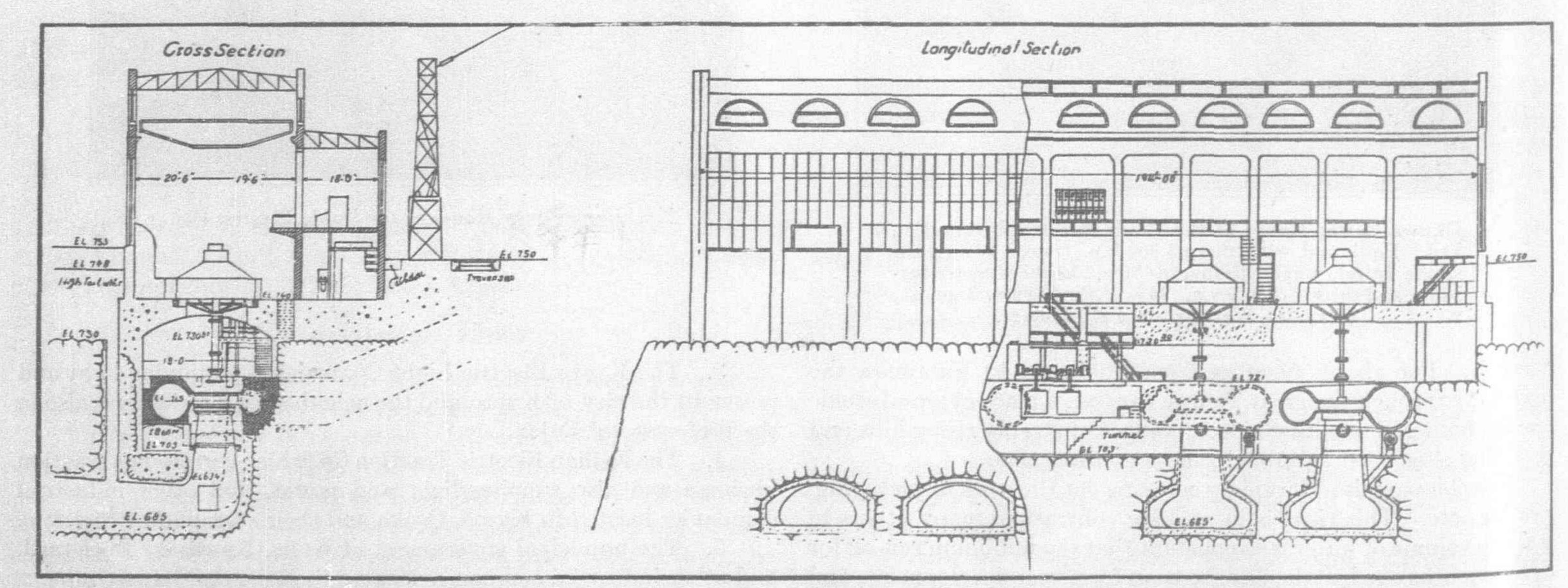
6. The municipal government of Tokyo and the Tokyo Electric Light Co. are the principal factors with which the Daido should



General View of the Yomikaki Power Station. Equipped with three 22,000 h.p. (max.) single spiral, single discharge, vertical type Escher, Wyss water turbines, 360 r.p.m. and three 17,000 k.v.a., 80% P.F., 6,600 v., 3 phase, 60 cycles, Westinghouse alternators



Momoyama Power House: Equipped with two single spiral, single discharge, vertical type Escher, Wyss water turbines, 20,000 h.p. (max.) 300 r.p.m. and two 15,000 k.v.a., 80% P.F., 6,600v., 3 phase, 60 cycles, Westinghouse alternators



Ohi Power Station: Equipped with four 18,000 h.p. (max.) 180 r.p.m. single spiral, single discharge, vertical type Allis-Chalmers water turbines and four 13,750 k.v.a., 80% P.F., 6,900 v., 3 phase, 60 cycles, General Electric alternators

co-operate in supplying power to Tokyo, Yokohama and their surrounding districts upon completion of the proposed Tokyo transmission system.

Thus the greater part of the power generated is delivered over the transmission lines to the substations of the wholesale consumers who in turn distribute it to the smaller consumers.

Light and power to be consumed by these cities and companies are as follows:

		Lights Installed	Power Sold H.P.
Osaka Electric Light Co.	***	1,538,927	87,222
Osaka City	***		5,830
Kyoto Electric Light Co		593,903	28,406
Kyoto City		235,403	10,012
Keihan Electric Traction Co.		96,903	11,668
Kobe City		423,182	20,372
Tokyo City		707,438	31,291
Tokyo Electric Light Co		2,367,823	235,394
Toho Electric Power Co		1,904,438	114,597
Total		8,868,017	544,792
Whole Country		14,167,685	1,359,208
Per cent. of Whole Country	***	62%	40%

GENERAL BALANCE SHEET, MAY 31, 1922

Assets

					Yen.
Uncalled capital					55,680,000.000
Power house const					16,478,649.942
Transmission line					2,366,803.092
Sub-station constr	uction	1			1,455,081.386
General constructi	ion ac	count			7,054,562.326
Telephone line					16,609.270
Distribution line					35,732.074
Real estate					5,519,332.320
Furniture, etc.					169,457.690
Future extension	& dev	relopme	ent acc	ount	29,522,492.575
Stores account					415,235.509
Commission on sal	e of d	ebentu	res		392,855.000
Pending account r	eceiva	ble			
Bills receivable					337,058.460
Account receivable	е				AOM DOM DOD
Stock of other con	panie	s inves	ted		7,832,823.900
Securities deposite	d				2,029,452.500
Deposit in bank					410,218.140
Cash on hand			• • •		46,545.510
Total Assets				Y.1	36,780,944.453

Y.136,780,944.453

Y.2,209,605.252

$oldsymbol{L}$	nabili	ties	
			Yen.
Authorized capital			100,000,000.000
Legal reserve			303,608.000
Debentures			10,000,000.000
Debts and bills payable			19,140,064.980
Employee's savings			84,686.330
Pending account payable			3,790,643.210
Account payable			1,795,183.490
Unpaid dividends			38,917.710
Balance brought down		• •	59,210.143
Surplus			1,568,630.590

CONDENSED FINANCIAL STATEMENT For the six months ending May 31, 1922

Total Liabilities

Total

Income

				Yen.
Business income				1,873,460.850
Interest and profit on se	curities	3		304,071.167
Miscellaneous income				32,073.235
			-	

223	100		
- 84"	xp	000	00
18:4	1.48	F , FF ,	N.P.
-	20.30	NY 25 361	400

					Yen.
Operating	expense	е		 	194,259.829
Taxes				 	94,438.960
General ex	pense		••		352,275.873
Total				Y	. 640,974.662
Net profit	for the	six mo	onths		.1,568,630.590

DIVIDEND RECORD

Dividends are payable June and December, and the rates since 1921 are listed as follows:

	1921	1922
First half	 6%	6.4%
Second half	 6.2%	

CONSTRUCTION COST

GENERATING STATIONS

Name of Plan	t	Capacity K.W.	In Operation Yen.	Under Construction Yen.	Cost per K.W. Yen.
Okuwa Kushihara Nishikadohara Suhara Yomikaki Ohi Momoyama		14,700 $11,000$ $6,000$ $7,200$ $9,200$ $40,700$ $42,900$ $23,100$ $12,500$	5,086,077.219 5,112,782.483 3,474,663.577 2,670,636.110 4,545,715.000	13,748,069.220 $12,243,300.000$ $6,640,000.000$ $3,036,500.700$	345.992 464.798 579.111 370.922 494.099 337.790 $285,392$ 287.446 242.920
		167,300 truction Cos	20,889,874.389 st	35,667,869.920 Y.56,557,744.309	

SUB-STATIONS

Y.338.062

Average Cost per K. W.

Name of 8	Sub-Stat	ion	Capacity	In Operation	Under
			K.V.A.	Yen.	Yen.
Rokugo			15,000	393,064.938	
Mizuho			9,000	315,941.412	
Tokitsu			1,050	91,013.592	
Tögö	***		450	38,898.210	
Takefu	***		8,100	183,131.400	
Osaka	***	***	141,000	8,868,800.000	
Rokugo	No. 2	***	15,000		433,031.830
Sango	***	***	15,000		500,000.000
Suhara		***	50,400		1,554,000.000
Mizuho	No. 2		9,000		276,000.000
Total	***			9,890,849.552	2,763,031.830

TRANSMISSION LINES

Total Construction Cost ...Y.12,653,881.382

Average Cost per K.W. ...

	COLLICATOR	ION LILINES	
Name of Line	Length	In Operation	Under
	Mile	Yen.	Yen.
Shizumo to Rokugo	48.2	1,059,571.328	
Kushihara to Mizuho	30.6	773,583.808	
Kushihara to Mizunami	16.3	183,615.336	
Nishikadohara to Takefu		350,032.620	
Nagoya to Osaka	000	8,078,750.000	
Nojiri to Nagoya	~~ ~	2,686,300.000	
Suhara to Nojiri	3.0	98,000.000	
Kachikawa to Kiyosu	6.4	326,485.000	
Momoyama to Suhara	3.0		122,475.000
Kiyosu to Suhara	6.7		5,360,150.000
Kema to Sango	3.5		549,000.000
Sango to Furukawabashi	1.5		53,150.000
Tokise to Yodaira	25 W		89,200.000
Kushihara to Mizuho	30.6		181,000,000
Seki to Kiyosu	22.0		1,562,872.000
Total		13,556,338,092	7.917.847.000

The total construction cost for generating stations, sub-stations,' and transmission lines in operation amounts to Y.44,337,062.042, and for the work under construction Y.46,348,748.750. The average cost per kilowatt for the whole work amounts to Y.542.055.

Y.128.357

Total Construction Cost ... Y.21,474,185.092

Average Cost per K.W. ...

Business Prospects

The prospects of the Daido Electric Power Co. with its natural resources and geographical advantages are exceptionally bright. Early in 1924 the total power developed will exceed 167,000 k.w. and the transmission system will extend more than 500 miles. A total number of eight water plants and one steam plant will be in operation. The average construction cost for generating stations, sub-stations, and transmission lines inclusive does not exceed Y.550 per kilowatt. It is expected, therefore, that within two years the Daido will be in a position to declare dividends on its shares at the rate of at least 12 per cent. per annum.

Power Stations and Equipment

SUHARA POWER STATION.—Effective discharge, max. 1,300 cub. ft. sec., min. 390; effective head, 114.49-ft.; theoretical horse-power, 15,343; out-put in k.w., max. 9,200, min. 4,600; total length of waterway, 10,698-ft.; length of tunnel, 3,978-ft.; work began, May—1920; completed, July—1922; main turbine: single spiral, single discharge, vertical type. 2—7,500 h.p. (max.), 225 R.P.M. Maker: Escher Wyss. Main generator: 2—5,500 K.V.A., 80% P.F., 6,600v, 3 phase, 60 cycle. Maker: Westing-house. Transformer: 4—4,500 K.V.A., 6,600/77,000v, delta-delta (1 spare). Maker: Hidachi. Switchboard: Type—Bench type. Maker: Shibaura.

Kushihara Power Station.—Effective discharge, max. 393 cub. ft. sec., min. 260; effective head, 231-ft.; theoretical horse power, max. 10,252; min. 6,853; out-put in k.w., max. 6,000; min. 3,000; total length of waterway, 20,734-ft.; length of tunnel, 10,791-ft.; work began, October—1919; completed, December—1920. Main turbine: 2—5,500 h.p. (max.), 514 R.P.M. double spiral, double discharge horizontal shaft. Maker: Hidachi. Main generator: 2—3,750 K.V.A., 80 % P.F., 6,600v, 3 phase, 60 cycle. Maker: Hidachi. Transformer: 7—1,500 K.V.A., 2,300—6,600/77,000v delta-delta (1 spare). Maker: Shibaura. Switch-board: Type—Panel type. Maker: Shibaura.

Yomikaki Power Station.—Effective discharge, max. 1,573 cub. ft. sec., min. 963; effective head, 367-ft.; theoretical horse-power, max. 65,712, min. 40,249; out-put in k.w., max. 40,700, min. 24,954; total length of waterway, 36,346-ft.; length of tunnel, 31,880-ft.; work began, December—1921; to be completed, September—1923. Main turbine: single spiral, single discharge, vertical type. 3—22,000 h.p. (max.), 360 R.P.M. Maker: Escher Wyss. Main Generator: 3—17,000 K.V.A., 80% P.F., 6,600v., 3 phase, 60 cycle. Maker: Westinghouse. Transformer: 9—8,500 K.V.A. 6,600/89,000v, delta-star neutral ground through resistance.

(3 spare). Maker: General Electric.

Ohi Power Station.—Effective discharge, max. 4,424 cub. ft. sec., min. 575; effective head, 140-ft.; theoretical horse-power, max. 69,300, min. 9,125; out-put in k.w., max. 42,000; min. 5,150; max. height of dam, 182-ft.; length of pressure tunnel, 2,982-ft.; work began, January—1922; to be completed, December—1923. Main turbine: single spiral, single discharge vertical type. 4—18,000 h.p. (max.), 180 R.P.M. Maker: Allis-Chalmer. Main generator: 4—13,750 K.V.A. 80% P.F., 6,600v., 3 phase, 60 cycle. Maker: General Electric. Transformer: 9—9,200 K.V.A., 6,600/89,000v., delta-star non-grounded (3 spare). Maker: Westinghouse. Switchboard: Type: Bench type. Maker: Westinghouse.

OKUWA POWER STATION.—Effective discharge, max. 1,300 cub. ft. sec., min. 639; effective head, 127-ft.; theoretical horse-power, max. 18,600; min. 9,300; out-put in k.w., max. 11,000; min. 5,600; total length of waterway, 13,821-ft.; length of tunnel, 7,772-ft.; work began, October—1919; completed, July—1920. Main turbine: 3—5,800 h.p. (max.), 277 R.P.M., single spiral, single discharge vertical. Maker: Allis-Chalmer. Main generator: 3—5,000 K.V.A., 80% P.F., 6,600v, 3 phase, 60 cycle. Maker: Westinghouse. Transformer: 4-5,000 K.V.A. 6,600/77,000v., delta-delta (1 spare). Maker: Westinghouse. Switchboard: Type: Bench type. Maker: Shibaura.

SHIZUMO POWER STATION.—Effective discharge, max. 1,475

cub. ft. sec., min. 885; effective head, 163-ft; theoretical horse. power, max. 25,519; min. 15,284; out-put in k.w., max. 14,700, min. 8,400; total length of waterway, 15,969-ft.; length of tunnel, 14,630-ft.; work began, October—1918; completed, October—1919. Main turbine: 3—7,500 h.p. (max.) 360 R.P.M. Twin spiral, single discharge, horizontal shaft. Maker: Boving. 1—3,850 h.p. (max.) 514 R.P.M. Single spiral, single discharge, vertical shaft. Maker: Okumura. Main generator: 3—5,250 K.V.A., 80% P.F., 360 R.P.M. 6,600v. 3 phase, 60 cycle. Maker: General Electric. 1—3,000 K.V.A., 80% P.F., 514 R.P.M. 6,600v. 3 phase, 60 cycle. Maker: Okumura. transformer: 7—2,630 K.V.A., 6,600/77,000v. delta-delta. Maker: Westinghouse. 1—3,000 K.V.A., 3 phase, 6,600/77,000v, delta-delta. Maker: Okumura. Switchboard: Type: Panel type. Maker: Shibaura.

Rokugo Sub-Station (30,000 K.V.A.).—Main transformer: 15—2,500 K.V.A., 60; P. 72,500v/70,000v/67,500v.; S. 11,000v. (3 spare). Maker: Westinghouse. Switchboard: Type: Panel type. Maker: Shibaura.

Momoyama Power Station.—Effective discharge, max. 1,300 cub. ft. sec., min. 639; effective head, 262-ft.; theoretical horse-power, max. 38,000; min. 19,000; out-put in k.w., max. 23,100, min. 11,650; total length of waterway, 13,974-ft.; length of tunnel, 13,974-ft.; work began, December—1921; to be completed, December—1923. Main turbine: Single spiral, single discharge, vertical type. 2—20,000 h.p. (max.), 300 R.P.M. or 250 R.P.M. Maker: Escher Wyss. Main generator: 2—15,000 K.V.A., 80% P.F. 6,600v, 3 phase, 60 cycle and 50 cycle. Maker: Westinghouse. Transformers: 7—5,000 K.V.A., 6,600/77,000v. delta-delta (1 spare). Maker: Siemens. Switchboard: Type: Bench type. Maker: Westinghouse.

Tokitsu Sub-Station (1,050 K.V.A.).—Main transformer: 3—350 K.V.A. 60, single phase; P. 75,000/72,500/70,000.; S. 3,500/3,300. Maker: *Hitachi*. Switchboard: Type: *Panel*. Maker: *Hitachi*.

Togo Sub-Station (450 K.V.A.).—Main transformer: 3—150 K.V.A. 60, single phase; P. 64,000/63,000/62,000; S. 3,300. Maker. Shibaura: Switchboard: Type: Panel. Maker. Shibaura.

Takefu Sub-Station (8,100 K.V.A.).—Main transformer: 4—2,700 K.V.A. 60, single phase; P. 64,000/63,000/62,000; S. 3,300 (1 spare); Maker; Shibaura. Switchboard: Type: Panel. Maker: Shibaura.

NISHIKADOHARA POWER STATION.—Effective discharge, max. 934 cub. ft. sec., min. 471; effective head, 124-ft.; theoretical horse-power, max. 13,181, min. 6,660; out-put in k.w., 7,200; total length of waterway, 9,067-ft.; length of tunnel, 9,067-ft.; work began, Oct.—1918; work completed, June—1919. Main turbine: 3—3,700 h.p. (max.) 514 r.p.m., twin frontal, Francis turbine. (1 spare). Maker: Dengyosha. Main generator: 3—2,820 k.v.a., 85% P.F., 6,600v., 3 phase, 60 cycle, 514 R.P.M. (1 spare). Maker: Shibaura. Transformers: 4—3,000 K.V.A., 6,700v, 6,600v, 6,500v,/66,000v., single phase, delta-delta (1 spare). Maker: Shibaura. Switchboard: Type: Panel type. Maker: Shibaura.

MIDZUHO SUB-STATION (18,000 K.V.A.).—Main transformer: 7—3,000 K.V.A. 60, single-phase; P. 72,500v./70,000v/67,500v.; S. 11,000v. (1 spare). Maker: Shibaura (Indoor type). Mitsubishi (Outdoor type). Switchboard: Type: Panel type. Maker: Shibaura.

OSAKA SUB-STATION (141,000 K.V.A.).—Main transformer: 18—9,400 K.V.A.; P. 80,800v. S. 31,800v. T. 11,000v., single phase (3 spare). Maker: Westinghouse. Switchboard: Type: Bench type. Maker: Westinghouse. Synchronous condensers: 6 15,000 K.V.A. 11,000v. Maker: 3. G. E. Co.; 3. Westinghouse.

Suhara Sub-Station (50,000 K.V.A.) (under construction).— Main transformer: 9—8,400 K.V.A. 60, single phase. P. 77,000; S. 154,000. (1 spare). Maker: Westinghouse. Switchboard: Type:

Bench board. Maker: Westinghouse.

Sango Sub-Station (15,000 K.V.A.) (under construction).—
Main transformer: 4—5,000K.V.A., single phase; T. 55,000v/53,000v;
S. 22,000v/11,000v (1 spare). Maker: Mitsubishi. Switchboard:
Type: Panel type. Maker: Inouye.